MEMORANDUM

DATE: July 1, 2019

PREPARED BY: James R. Kuipers, P.E., & Bruno A. Ridolfi, P.E.

SUBJECT: **Inaccurate and misleading statements of Purpose and Need in the Proposed Pebble Project DEIS**

Executive Summary

The comments in this memorandum pertain to the inaccurate and misleading statements contained in the DEIS with respect to the Purpose and Need for the proposed Pebble Project. This memorandum also includes other comments on Section 1 of the DEIS. The purpose and need evaluation and discussion are the foundation of the USACE regulatory process and an EIS. Based on the overly limited nature of the purpose and need statement in the DEIS, the lack of supportable economics for the proposed project, and the absence of a valid array of alternatives, the USACE should either decide that the proposed project is too speculative and halt the environmental review process or undertake a complete revision of the DEIS including a revision of the purpose and need evaluation for the project and prepare and recirculate a revised DEIS to cooperating agencies and the public for review and comment.

DEIS General Comments

Language and Accessibility

An EIS should be clearly written for public review and use accessible language. Even in the introductory section of the Pebble DEIS, there is an overuse of jargon and acronyms. This is especially troublesome for Alaska Native residents in the Bristol Bay region whose first language is their native tongue. The DEIS should be revised to minimize the use of acronyms and ensure that the language used is accessible to the people of the affected communities and the public.

This section is incomplete as written. It is typical in an EIS to include the following information in Chapter 1.0 Purpose and Need:

Background

The background section should provide a general description of the proposed project area including its location related to major towns and cities, watersheds, areas of special interest (e.g. national parks, wilderness areas, state parks), and a concise description of the project's proposed production. This section should include information about the original project discovery and the various developments that have occurred prior to the application for a permit that initiated this EIS. This should include discussion about previous project proposals as well as associated evaluations by EPA and other regulatory agencies concerning the proposal for mining of the Pebble deposit. It should include information about the project proponent including their history and address their capacity, such as whether they are an existing reputable mining company with currently active mining operations, or whether this would be their first and only operation. This section should also disclose to what extent, if any, a completeness review was conducted on the proponent's application for a permit, prior to initiation of the NEPA process. The USACE should revise the DEIS to include the essential background information that's described above.

Decisions to be Made

In addition to describing the decisions to be made by the USACE, this section should identify all the other regulatory agencies with decision making authority, what the authorities are, and when and how compliance will be achieve with the applicable regulations. The USACE should revise the DEIS to include the information described above pertaining to regulatory agencies, regulatory decisions that must be made, and compliance with applicable regulations.

Significant Issues

With respect to an EIS, issues are points of discussion, debate, or dispute with respect to the environmental impacts of the proposed action. Issues may be determined to be significant based on the extent, duration, or magnitude of the environmental effect. Significant issues focus the environmental analyses in the EIS on those aspects of the project that are of the greatest concern to regulatory agencies or the public or that have the most potential for producing adverse environmental effects. Alternatives to the proposed action or specific mitigation measures are developed in response to significant issues. By associating measures with individual issues, the public and decision-makers are better able to differentiate among different alternatives in terms of environmental impacts. The significant issues based on public, tribal, and agency comments made during the scoping process should be summarized in this section. The summary for each issue should describe the measures to be used to assess each of the issues across alternatives at the end of each item. Furthermore, it is rare that so many interested and commenting parties agree on the issues and concerns. Therefore, the USACE should revise the

DEIS to display the issues and concerns described above and discuss how USACE will address these issues and concerns in the permit evaluation process and decision-making process.

Agency Responsibilities, Approvals and Compliance

This section typically describes the primary roles of each agency involved in developing the EIS. Chapter 1 should include information on the EIS scoping, public involvement, and government-to-government consultations with tribes. The USACE should revise the DEIS to include information regarding the roles of regulatory agencies involved in the EIS process, EIS scoping, public involvement, and government-to-government consultation with Alaska Native tribes.

DEIS Detailed Comments

The Purpose and Need section of an EIS is considered by many to be the most important part, as it speaks to and in fact should direct the remainder of the EIS in terms of alternatives development and analysis, impacts evaluation, and mitigation.

As noted in the following comments and in the attached memorandum: *Technical Review of Economic Feasibility of Proposed Pebble Project* (Attachment 5A), the proposed Pebble Project is highly speculative. There is not a clear need to support the purpose relative to the site-specific nature of the proposal. Simply put, there are other places in the world where copper, gold, and molybdenum could be mined with far less environmental impact than in the proposed location.

According to Section 1.5 of the DEIS: *"PLP's (the applicant) stated need for the proposed project is, 'to meet the increasing global demand for commodities such as copper, gold, and molybdenum.'"* (DEIS at 1-3). It goes on to say: *"Any overall purpose must seem feasible as well as take into account the need for the type of proposed development. The USACE has determined that the overall project purpose is to develop and operate a copper, gold, and molybdenum mine in Alaska in order to meet current and future demand."* (DEIS at 1-4).

This section fails to take into account the need for the type of proposed development. This section demonstrates neither a need for the project in Alaska nor in the United States. The DEIS should have noted that the primary commodities to be produced by the project (copper, gold, and molybdenum) are not considered by the United States to be "critical minerals." Pursuant to Executive Order 13817 dated December 20, 2017, ''A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals,'' the Secretary of the Interior on May 18, 2018 presented a final list of 35 mineral commodities deemed critical under the definition provided in the

Executive Order.[1] The final list was prefaced by an explanation of critical minerals as follows: "The United States is heavily reliant on imports of certain mineral commodities that are vital to the Nation's security and economic prosperity. This dependency of the United States on foreign sources creates a strategic vulnerability for both its economy and military to adverse foreign government action, natural disaster, and other events that can disrupt supply of these key minerals." (83 Fed. Reg. at 23,295).

The Final List of Critical Minerals includes: Aluminum (bauxite), antimony, arsenic, barite, beryllium, bismuth, cesium, chromium, cobalt, fluorspar, gallium, germanium, graphite (natural), hafnium, helium, indium, lithium, magnesium, manganese, niobium, platinum group metals, potash, the rare earth elements group, rhenium, rubidium, scandium, strontium, tantalum, tellurium, tin, titanium, tungsten, uranium, vanadium, and zirconium.

The United States is currently, and for the foreseeable future, a global supplier of copper, gold, and molybdenum as the country's current and future planned production exceeds demand, and domestic production is diverse. With respect to the USACE's determined overall project purpose, there is no apparent need in the United States, including Alaska, for an additional copper, gold, or molybdenum mine to meet current or future domestic demand. It is not the role or responsibility of the USACE to address global demand or to speculate on future global demand for these metals. The USACE should address in the DEIS this potential conflict between current uses of natural resources and the expected sacrifice of these resources to accommodate the mine and facilities of the proposed project. The USACE should consider whether there is in fact a legitimate need for the proposed project that outweighs the significant impacts to and permanent and irreversible loss of natural resources that would be caused if the proposed project is permitted, constructed, and operated.

Since the need for this project is predicated on global supply and demand, and because the potential environmental impacts are great, a better case needs to be made that the proposed project is necessary to meet global requirements for these minerals. In the context of the DEIS, simply discussing whether there is adequate supply of such metals is insufficient; the DEIS also needs to address whether there are other practicable alternatives for meeting this apparent demand that would be less environmentally damaging.

[1] Final List of Critical Minerals 2018, 83 Fed. Reg. 23,295 (May 18, 2018).

The reasons for and implications of the USACE's change in the wording of the project's purpose and need are unclear; however, the wording seems to be designed to inappropriately limit the scope of potential alternatives for review. The purpose of the project cannot simply be to "*develop and operate a copper, gold, and molybdenum mine in Alaska,*" since there is no particular need to have such a mine specifically located in Alaska, and project alternatives that could be sited elsewhere in Alaska are not discussed. The addition of "*in Alaska*" implies that the only practicable alternatives that would be considered are those located in Alaska; however, according to the applicant's own description, the demand being addressed is both national and global. Therefore, the USACE should include other alternatives both nationally and globally for meeting this demand and evaluate these alternatives in a revised DEIS. Such alternatives would include other projects throughout the world that would produce copper, molybdenum, or gold and are already under development or being proposed.

Consideration of global purpose and need is particularly appropriate considering the natural resources and human resources that could be adversely affected if the proposed project is permitted, constructed, and operated. Bristol Bay has globally important aquatic resources, economically important fisheries, and world-renowned wildlife resources all of which are untouched by development. There are several National Parks and National Wildlife Refuges in the proposed project area that contain irreplaceable resources. Alaska Native cultural ways of life are intrinsically place-based, and once adversely impacted or destroyed, these cultural lifeways are also irreplaceable. Mining projects are an intense land use and are intrinsically destructive; therefore, the proposed project in the proposed location will cause serious multi-generational adverse impacts on Native American communities that cannot be mitigated or restored. Avoidance of these impacts through careful consideration of the need for this project is essential.

Conclusions and Recommendations

The purpose and need statement in the DEIS for the proposed Pebble Project does not respect the critical nature or importance of purpose and need information as the underlying foundation of an EIS.

Based on speculative project economics, as demonstrated by the attached economic feasibility analysis (Attachment 5A), the USACE should conclude that the purpose of the proposed project is too speculative and halt the environmental review process.

If the USACE decides to continue the environmental review process, the USACE needs to thoroughly revise the DEIS and redistribute the revised DEIS to cooperating agencies and the public for review and comment.

The revised DEIS should include the sections and information described above and address comments provided in this memorandum and previously in similar memoranda submitted to the USACE during our review of the Preliminary DEIS.

Given the level and relevance of public interest in this proposed project, the USACE needs to invest substantially more effort in developing the justification for the project, and that justification should include weighing the purpose and need for this project against the purpose and need to protect the existing resource values including natural resources, human uses and values, and cultural resources of the Bristol Bay Region.

Application Description

A two-paragraph description of the permit application is insufficient and inadequate for a project of this size. The USACE should revise the DEIS to significantly expand the project description with maps, figures, and a more detailed description of each major project element. Portions of the Project Description with accompanying figures that were provided as Attachment D to the permit application would be appropriate for this purpose. As a public review DEIS for such a significant project, the public should be provided with a clear and complete description of the entire project, without having to search through attachments and appendices to learn what the proposed project consists of.

Federal Decisions to be Made

The USACE needs to revise Section 1.3 or Section 1.4 to identify independent public review processes and opportunities for comment associated with the U.S. Coast Guard (USCG) and Bureau of Safety and Environmental Enforcement (BSEE) decisions.

While USCG and BSEE might be the only other federal agencies with direct permitting authority, there are requirements for consultation with other federal agencies (e.g., natural resource trustees) and state agencies, as well as consultation with Alaska Native governments. State and local agencies also have a permitting role for the project. The USACE should revise the DEIS to describe these other permitting processes and their relationship to the federal permitting process.

Environmental Analysis

The USACE is required by law to develop a range of alternatives to address major issues. NEPA requires the agency to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources" 42 U.S.C. § 4332(E). The USACE must "[r]igorously explore and objectively evaluate all reasonable alternatives" to the proposed action. 40 C.F.R. § 1502.14(a). Indeed, NEPA's implementing regulations recognize that the "consideration of alternatives is 'the heart of the environmental impact statement.'" *Alaska Wilderness Recreation and Tourism Association v. Morrison*, 67 F.3d 723, 729 (9th Cir. 1995) (quoting 40 C.F.R. § 1502.14). In this case, as identified in our comments on Chapter 2 of the PDEIS, the USACE fails to meet this requirement.

The proposed project cannot be implemented in a manner that avoids the potential for significant and irreversible environmental harm. The proposed project is just too large in scope, magnitude and intensity. It is also clear that potential impacts of constructing and operating the proposed project elements cannot be mitigated in a reasonable manner. The USACE should revise this section to be more specific about whether and under what circumstances the environmental analysis could result in a decision that the project would not be permitted. Currently, the DIES reads as though the USACE must select one of the action alternatives, i.e., that the agencies' only responsibility is to identify and select "the least environmentally damaging practicable alternative" and cannot select the No Action Alternative. Yet, it may be the case that the only "practicable means to avoid or minimize environmental harm" is to select the No Action Alternative and do not permit the proposed project. This section needs to be more specific about whether this falls within the scope of the USACE decision authority.

Attachment 5A: Technical Review of Economic Feasibility of Proposed Pebble

MEMORANDUM

DATE: May 1, 2019

PREPARED BY: James R. Kuipers, P.E., Kuipers & Associates

SUBJECT: **Technical Review of Economic Feasibility of Proposed Pebble Project**

Executive Summary

The findings of this technical review of the Economic Feasibility of the proposed Pebble Project are summarized as follows:

Project Economic Viability

The Wardrop 2011 Preliminary Assessment (PA) and Northern Dynasty Minerals Ltd. (NDML) 2018 Technical Report (TR) both rely on Mineral Resource estimates rather than Mineral Reserve estimates. As noted by the Canadian Institute of Mining, Metallurgy and Petroleum (CIM), "*Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability*." Based on the information provided, the project has not demonstrated economic viability according to the standard of professional care required by accepted industry standards such as NI 43-101. Neither the Wardrop 2011 PA nor the NDML 2018 TR should be considered a prefeasibility or feasibility study, since the economics and technical viability of the proposed Pebble Project have not been demonstrated at this time.

Technical and Economics Project Risks

Metals prices are a significant risk factor for the Pebble Project. Given the extremely high capital costs for the proposed Pebble Project combined with uncertainty as to the timing and price of future demand for metals commodities, the proposed Pebble Project carries a significant risk of economically failing due to variable metals prices, particularly in the first 5 to 10 years of the project's life.

While the Waldrop 2011 PA identified metal price sensitivity as having the greatest impact on project economics, it is clear given the current trend of significant underestimation of capital and operating costs, when likelihood is considered, there is a greater risk from capital and operating cost overruns to the proposed Pebble Project than for any other economic risk factor. Capital and operating cost concerns have caused many existing projects to be currently delayed,

and alternative approaches, particularly using underground mining to reduce initial capital costs and access higher grade ore, are commonly being considered to address this economic challenge.

Reclamation and closure costs are expected to be great for the proposed project, and the financial assurance requirements for the proposed project are likely to exceed $1.5 billion. While not having the same impact as metals prices or capital and operating costs, the cost of providing financial assurance for reclamation and closure will have a definite impact on project economics and therefore this cost is an economic risk factor.

Project Alternatives

It is rare for a mining company to perform a feasibility analysis that does not contemplate exploitation of the entire resource. The Wardrop 2011 PA is constrained to the use of open pit mining methods and may represent the maximum reasonable extent to which the Pebble Project could be developed using open pit mining methods. Based on the information available, there is an equally high probability that if the proposed Pebble Project is ultimately permitted, the majority of the resource would be developed using underground mining methods, including potentially the initial underground mining of the resource, to reduce capital costs and access higher grades of ore early in project development.

Given the present marginal project economics, it is highly likely that the proposed Pebble Project will consider increasing the production rate beyond that contemplated in the 2011 Wardrop PA as a means of improving project economics. It would not be unusual for the increased production rate to be proposed after permitting is completed but before actual construction begins.

Introduction

This review of the economic feasibility of the proposed Pebble Project is intended to address the following questions:

- Has the project been demonstrated to be economically feasible based on NI 43-101 Guidelines?
- Has the project been demonstrated to be economically feasible based on industry standards?
- What are the major technical and financial risks to the project?

- What are the potential actual development plans for the project?

Qualifications

I have an extensive background with more than 35 years involvement in mining metals and minerals including in the full-life cycle of exploration, project development, project permitting, construction, operations, reclamation, and closure. I graduated in 1983 with a B.S. in Mineral Processing from Montana School of Mines. In addition to growing up in a mining family and gaining practical experience prior to entering University, I have worked as a senior engineer, chief metallurgist, mill superintendent, mine manager, project manager, and consulting engineer. Since 1996 I have been the principal consulting engineer with Kuipers & Associates. My work during that time has focused on providing technical expertise to public interest groups, tribes and first nations, and governments concerning mining and environmental concerns. The primary areas of expertise in which I have provided services include site characterization, water quality predictions, mine planning and mitigation, tailing storage facilities, mine reclamation and closure, site investigations and remediation, water treatment, financial assurance, and economic evaluations.

I am a registered Professional Engineer in Mining in the States of Montana and Colorado. I have been qualified as an expert witness in mining and related matters in several administrative hearings in the U.S. and Canada, and I have been qualified as an expert witness in U.S. Federal and State Courts. I have conducted numerous feasibility analysis analyses and extensive reviews of similar projects throughout my professional career. I am very familiar with the NI 43-101 Guidelines[1] and meet the definition of a "qualified person" consistent with the guidelines. My professional resume is attached as Attachment 5A-1.

Documents and Other Information Relied Upon

The primary documents that I have reviewed in conducting this analysis were:

- (Wardrop 2011 PA) Preliminary Assessment of the Pebble Project, Southwest Alaska, Wardrop for Northern Dynasty Minerals Ltd., Issue Date: February 17th, 2011.
- (NDML 2018 TR) Technical Report on the Pebble Project, Southwest Alaska, USA, Northern Dynasty Minerals Ltd, Issue date February 22, 2018.

[1] National Instrument 43-101 Standards of Disclosure for Mineral Projects, Rules and Policies, June 24, 2011. http://web.cim.org/standards/documents/block484_doc111.pdf

In addition, I have relied on other documents as referenced in this report.

Summary of Primary Documents

The following sections summarize the information on resources and economic feasibility contained in the Wardrop 2011 PA and NDML 2018 TR.

Wardrop 2011 PA

The Wardrop 2011 PA estimated mineral resources for the Pebble Project as shown in Table 1. Estimated measured and indicated mineral resources total 6.5 billion tonnes with a copper equivalent (CuEq) grade of 0.76 percent containing 98.1 billion CuEq pounds. Estimated inferred mineral resources total 4.5 billion tonnes with a CuEq grade of 0.55 percent containing 49.0 billion CuEq pounds. The total mineral resource is estimated to be 10.9 billion tonnes with CuEq grade of 0.67 percent containing 147.1 billion CuEq pounds.

Table 1. 0.3% CuEq Cutoff Resource Estimate Pebble Project Mineral Resources (2011)

Category	Tonnage	Cu (%)	Au (g/t)	Mo (ppm)	Cu Blb.	Au Moz.	Mo Blb.	CuEq (%)	CuEq Blb.
Measured + Indicated	5,942,000,000	0.42	0.35	250	55.0	66.9	3.28	0.78	102.2
Inferred	4,835,000,000	0.24	0.26	215	25.6	40.40	2.29	0.53	56.5
Total	10,777,000,000	0.37	0.31	235	80.6	107.3	5.57	0.74	158.7

% = percent Au = gold Blb. = billions of pounds Cu = copper
g/t = grams per metric ton Moz. = millions of ounces Mo = molybdendum ppm = parts per million

The Wardrop 2011 PA considered three production cases based on an initial open pit mine and subsequent expansion of the mine in two phases. The three production cases are described as follows:

1. The Investment Decision Case (IDC Case), which describes an initial 25-year open pit mine life upon which a decision to initiate mine permitting, construction and operations may be based

2. The Reference Case, which is based on 45 years of open pit mine production

3. The Resource Case, which is based on 78 years of open pit mine production and seeks to assess the long-term value of the project in current dollars

The summary of production results for the three cases is shown in Table 2.

The 25-year IDC Case would mine 80M ton/year of ore at a waste-to-ore (waste:ore) ratio of 1.5; process a total of 2.0 billion tons with a CuEq grade of 0.72%; and produce 12.9B pounds (lbs.) of copper, 16.4 M ounces (Moz.) of gold and 616 Mlbs. of molybdenum, as well as 67 Moz. of silver, 502,000 kilograms (kg) of rhenium, and 385,000 oz. of palladium.

Table 2. Pebble Project Summary of Production Results – All Cases (Wardrop 2011 PA Table 1.1.1)

Item	Unit	IDC Case	45-Yr Resource Case	78-Yr Resource Case
Mine Life	years	25	45	78
Mining Method		Open Pit	Open Pit	Open Pit
Production Rate	M t/year	80	84	84
Strip Ratio	waste : ore	1.5	2.1	2.6
Total Processed	M t	1,990	3,767	6,528
% of M+I+I Resource	%	17	32	55
Cur Eq. Grade	%	0.72	0.83	0.84
Cu Grade	%	0.38	0.46	0.46
Au Grade	oz./M t	0.012	0.011	0.011
Mo Grade	ppm	182	214	243
Cu Recovery	%	86.6	87.9	88.4
Au Recovery	%	71.5	71.3	71.2
Mo Recovery	%	84.8	87.9	89.4
Cu Equivalent Recovered	M lb.	24,483	54,129	96,357
Cu Recovered	M lb.	12,944	30,494	53,437
Au Recovered	k oz.	16,391	30,307	50,133
Molybdenum Recovered	M lb.	616	1,420	2,835
Peak Annual Cu Recovered	M lb.	822	1,157	1,096
Peak Annual Au Recovered	k oz.	1,038	1,127	1,088
Peak Annual Mo Recovered	M lb.	43	56	62
Avg. Annual Cu Recovered	M lb.	518	678	685
Avg. Annual Au Recovered	k oz.	656	673	643
Avg. Annual Mo Recovered	M lb.	25	32	36
26% Cu Concentrate Produced	k dmt	22,582	53,200	93,225
52% Mo Concentrate Produced	k dmt	537	1,239	2,473

% = percent dmt = dry metric tonnes IDC = Investment Decision Case k = thousands
lbs. = pounds M = millions oz. = ounces ppm = parts per million
t = metric ton waste:ore = waste-to-ore ratio

The 45-year IDC Case would mine 84 M metric ton/year of ore at a waste:ore ratio of 2.1; process a total of 3.8 billion tons with a CuEq grade of 0.83%; and produce 30.5 B lbs. of copper,

30.3 Moz. of gold, and 1.4B lbs. of molybdenum, as well as 140 M oz of silver, 1.2 M kg of rhenium, and 907,000 oz of palladium.

The 78-year IDC Case would mine 84M metric ton/year of ore at a waste:ore ratio of 2.6; process a total of 6.5 billion tons with a CuEq grade of 0.84%; and produce 53.4B lbs. of copper, 50.1M oz of gold, and 2.8B lbs. of molybdenum, as well as 242M oz of silver, 2.3M kg of rhenium, and 1.59M oz of palladium.

The economic analysis used the metal price assumptions shown in Table 3. The analysis uses both "long-term metal prices" and "current prevailing metal prices" based on the definition of these prices at that time.

Table 3. Pebble Project Metals Price Assumptions from Wardrop 2011 PA Table 1.1.2

Metal Type	Unit	Long-term Metal Prices	Current Prevailing Metal Prices
Copper	$/lb.	2.5	4
Gold	$/oz.	1,050	1,350
Molybdenum	$/lb.	13.5	15
Silver	$/oz.	15	28
Rhenium	$/kg.	3,000	3,000
Palladium	$/oz.	490	490

$/kg = US dollar per kilogram $/lb. = US dollars per pound $/oz. = US dollars per ounce

> *The 25-, 45-, and 78-year cases would result in mining 17%, 32% and 55%, respectively of the total mineral resource. The Wardrop 2011 PA makes note of the inclusion of inferred resources in the three cases. Inferred resources included in the 25-, 45-, and 78-year cases are 16%, 28%, and 33%, respectively of the total ore mined. The document provides the following disclaimer in this regard:*

The Pebble Project financial results are summarized in Table 4. The results based on the "long-term metal prices" assumptions are summarized as follows:

- The 25-Year IDC Case achieves a Life of Mine (LOM) pre-tax net cash flow of $20.1 billion, Net Present Value (NPV) at 7% of $3.8 billion, an Internal Rate of Return (IRR) of 13.4%, and a payback period of 6.5 years.
- The 45-year Reference Case achieves a LOM pre-tax net cash flow of $55.3 billion, NPV at 7% of $6.1 billion, an IRR of 14.2%, and a payback period of 6.2 years.

- The 78-year Resource Case achieves a LOM pre-tax net cash flow of $87.3 billion, NPV of $6.8 billion, an IRR of 14.5%, and a payback period of 6.1 years.

The Wardrop 2011 PA included a sensitivity analysis that suggested that for all three cases the project pre-tax NPV (at a 7% discount rate) is most sensitive to metal prices, operating costs, and capital costs in decreasing order.

Table 4. Pebble Project Summary Financial Results – All Cases from Wardrop 2011 PA Table 1.1.3

Item	Unit	IDC Case	45-Yr Resource Case	78-Yr Resource Case
Mine Life	years	25	45	78
Mining Method		Open Pit	Open Pit	Open Pit
Initial Capital	$ M	4,695	4,695	4,695
LOM Sustaining Capital	$ M	3,204	6,140	11,727
LOM NSR	$ M	54,637	120,197	213,970
NSR Per Ton	$/t	27.45	31.91	32.78
LOM Operating Cost	$ M	22,208	43,489	96,063
Operating Cost Per Ton	$/t	11.16	11.55	14.72
C1 Copper Cost	$/lb.	-0.1	-0.11	0.21
LOM Pre-Tax Net Cash	$ M	20,123	55,278	87,329
Long-term Metal Prices				
Pre-Tax NPV at 7%	$ M	3,837	6,129	6,812
Pre-Tax IRR	%	13.40%	14.20%	14.50%
Pre-Tax Payback	years	6.5	6.2	6.1
Current Prevailing Metal				
Pre-Tax NPV at 7%	$ M	11,410	15,709	16,864
Pre-Tax IRR	%	22.60%	23.20%	23.30%
Pre-Tax Payback	years	3.2	3.2	3.2

$ = US dollars; % = percent; IDC = Investment Decision Case; IRR = internal rate of return
lb. = pound; LOM = life of mine; M = million; t = metric ton
NPV = net present value; NSR = net smelter return

NDML 2018 TR

The NDML 2018 TR is a re-evaluation of the estimated mineral resources for the proposed Pebble Project. The results from the NDML 2018 TR are summarized in Table 5. Estimated measured and indicated mineral resources total 6.5 billion tonnes with a CuEq grade of 0.76% containing 98.1 billion CuEq pounds. Estimated inferred mineral resources total 4.5 billion tonnes with a CuEq grade of 0.55% containing 49.0 billion CuEq pounds. The total mineral

resource is estimated to be 10.9 billion tonnes with a CuEq grade of 0.67% containing 147.1 billion CuEq pounds.

Compared to the Wardrop 2011 PA, the revised resource estimate in the NDML 2018 TR adds only 0.1 billion tonnes to the resource estimate. The primary difference is due to the NDML estimate shifting approximately 0.5 billion tonnes from the inferred category to the measured and indicated category; however, this actually decreases the contained CuEq from 102.2 billion pounds to 98.1 billion pounds. Perhaps most notably, the NDML 2018 TR suggests that further evaluation of the mineral resource has led to a decrease in total resources from 159 billion pounds in 2011, to 147 billion pounds in 2018, a decrease of approximately 8 percent.

Table 5. Pebble Project Mineral Resources 0.3% CuEq Cutoff Resource Estimate (2018)

Category	Tonnage	Cu (%)	Au (g/t)	Mo (ppm)	Ag (g/t)	Cu Blb	Au Moz	Mo Blb	Ag Moz	CuEq (%)	CuEq Blb
Measured + Indicated	6,456,000,000	0.40	0.34	240	1.7	56.92	70.57	3.42	344.6	0.76	98.1
Inferred	4,454,000,000	0.25	0.25	226	1.2	24.54	35.80	2.22	170.4	0.55	49.0
Total	10,910,000,000	0.37	0.30	235	1.5	81.46	106.37	5.64	515.0	0.67	147.1

% = percent Ag = silver Au = gold Blb. = billions of pounds
Cu = copper g/t = grams per metric ton Moz. = millions of ounces Mo = molybdenum
ppm = parts per million

Project Economic Viability

The Wardrop 2011 PA includes a disclaimer regarding economic viability as previously noted and repeated here:

> *"(It should be noted that Inferred mineral resources are considered to be too speculative to allow the application of technical and economic parameters to support mine planning and the evaluation of the economic viability of the project. As such, there is currently no certainty that development cases incorporating Inferred mineral resources can be realized)."*

As was noted in both reports, the Mineral Resource estimates were conducted following the CIM Definitions Standards for Mineral Reserves in accordance with NI 43-101 Standards of Disclosure for Mineral Projects. The CIM Definitions Standards specifically contain the following information with respect to mineral resources and mineral reserves, as well as indicated and inferred mineral resources.

Mineral Reserve

A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.
The public disclosure of a Mineral Reserve must be demonstrated by a Pre-Feasibility Study or Feasibility Study.

Mineral Resource

A Mineral Resource is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction.

Inferred Mineral Resource

An "Inferred Mineral Resource" is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.

Due to the uncertainty that may be attached to Inferred Mineral Resources, it cannot be assumed that all or any part of an Inferred Mineral Resource will be upgraded to an Indicated or Measured Mineral Resource as a result of continued exploration. Confidence in the estimate is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure.
Inferred Mineral Resources must be excluded from estimates forming the basis of feasibility or other economic studies.

Indicated Mineral Resource

An "Indicated Mineral Resource" is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics, can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits,

workings and drill holes that are spaced closely enough for geological and grade continuity to be reasonably assumed.

Mineralization may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralization. The Qualified Person must recognize the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project. An Indicated Mineral Resource estimate is of sufficient quality to support a Preliminary Feasibility Study which can serve as the basis for major development decisions.

Conclusions

- The Wardrop 2011 PA and NDML 2018 TR both rely on Mineral Resource estimates rather than Mineral Reserve estimate. In addition, the Wardrop 2011 PA and NDML 2018 TR both rely in part on inferred rather than indicated mineral resources in the Mineral Resource estimates.

- As noted by CIM, "*Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability*." Neither the Wardrop 2011 PA nor the NDML 2018 TR should be considered a prefeasibility or feasibility study, as the economics and technical viability of the Project have not been demonstrated at this time. The PA is preliminary in nature and is based on Mineral Resources that are considered too speculative geologically to have the economic considerations applied that would enable these Mineral Resources to be categorized as Mineral Reserves. Furthermore, there is no certainty that the conclusions or results as reported in the PA will be realized.

- Based on my professional experience and knowledge, the conduct of any type of feasibility analysis based on mineral resources, and not on verifiable mineral reserves, is rarely performed and represents a questionable undertaking by a qualified person. Based on the information provided, the project has not demonstrated economic viability according to the standard of professional care required by accepted industry standards such as NI 43-101.

Major Technical and Financial Risks

As previously noted, the Wardrop 2011 PA included a sensitivity analysis that suggested the project NPV is most sensitive to metal prices, operating costs, and capital costs in descending

order. In addition, several major technical and financial risks exist for the proposed project including the costs of reclamation and closure and the project's social license. These risks are discussed in the following sections.

To assist in the assessment of these risks from an economics standpoint, each section within the Wardrop 2011 PA was reviewed, and the information was entered into an Excel spreadsheet to create a project economic pro forma. That information was then compared to the economic analysis information contained in the Wardrop 2011 PA.

The development of the Excel spreadsheet model was complicated by the abbreviated summary spreadsheets contained in the Wardrop 2011 PA. Instead of annual data as is usually provided for feasibility studies, the data represented periods of time and summarized production quantities and costs for the 78-year case. These data had to be extrapolated downward for the 45-year and 25-year cases. In addition, costs that were indicated for royalties and "local production taxes" and were clearly present in the cash flow analysis were not identified as line items in the information contained in the report. The royalties to TECK were identified in the report and applied to the Excel model as 4% pre-payback and 5% post-payback. "Local production taxes" were assumed to be gross expenditures and proceeds taxes of 5% applied to both operating profit and initial and sustaining capital expenditures. The Wardrop 2011 PA may have included provisions for reclamation and closure cost accrual; however, those costs were not identified or incorporated in the Excel model.

The Excel spreadsheet duplicated the Wardrop 2011 PA results is shown in Table 6. The detailed spreadsheets showing the information used is provided as Attachment 5A-2.

For the 25-year case, the net revenue in the Wardrop 2011 PA is $20.1 billion as compared to a net revenue of $18.2 billion in the Excel spreadsheet for the 20-year 2018 proposed mine for the EIS. This represents a difference of minus 9 percent (-9%). The NPV at 7 percent net discounted rate of return (NDROR) is $3.8 billion as compared to $3.6 billion, a difference of minus 5 percent (-5%). The Internal Rate of Return (IRR) is 13.4 percent as compared to 13.4 percent.

Table 6. Wardrop 2011 PA and K&A Spreadsheet Comparison Long-Term Metals Prices

Result	Units	25-year Case		45-year Case		78-year Case	
		Wardrop 2018 PA	K&A	Wardrop 2018 PA	K&A	Wardrop 2018 PA	K&A
NPV @ 0% DROR	$M	20,123	18,203	55,278	52,111	87,329	88,689
NPV @ 5% DROR	$M	6,363	5,975	11,163	11,311	12,941	13,899

NPV @ 7% DROR	$M	3,837	3,640	6,129	6,360	6,812	7,526
NPV @ 8% DROR	$M	2,901	2,764	4,510	4,737	4,964	5,576
NPV @ 10% DROR	$M	1,485	1,425	2,308	2,501	2,545	2,995
IRR	%	13.4	13.4	14.2	14.5	14.5	15.2
Payback	years	6.2	6.3	6.2	6.3	6.1	6.3

$M = millions of US dollars DROR = discounted rate of return IRR = internal rate of return
K&A = Kuipers & Associates NPV = net present value PA = Preliminary Assessment

For the 45-year case (6.5 B tonnes), the net revenue in the Wardrop 2011 PA is $55.3 billion as compared to $52.1 billion for the 20-year case (6.4B tonnes) in the Excel spreadsheet or a difference of minus 6 percent (-6%). The NPV at 7 percent net discounted rate of return (NDROR) is $6.1 billion as compared to $6.4 billion or a difference of plus 5 percent (+5%). The Internal Rate of Return (IRR) is 14.2 percent as compared to 14.5 percent or a difference of plus 2 percent (+2%).

For the 78-year case, the net revenue in the Wardrop 2011 PA is $87.3 billion as compared to $88.7 billion in the Excel Spreadsheet or a difference of plus 2 percent (+2%). The NPV at 7 percent net discounted rate of return (NDROR) is $6.8 billion as compared to $7.5 billion or a difference of plus 10 percent (+10%). The Internal Rate of Return (IRR) is 14.5 percent as compared to 15.2 percent or a difference of plus 5 percent (+5%).

The comparison shows that costs are present in the Wardrop 2011 PA that were not identifiable as line items and therefore are not exactly duplicated in the spreadsheet. This results in the spreadsheet showing slightly different results. Keeping the initial differences in mind, the spreadsheet model can be used to draw similarly comparative distinctions for the cost scenarios depicted in the following sections of this report.

Metal Prices

As was noted in the Waldrop 2011 PA, the economics for the proposed Pebble Project are most sensitive to metals prices. For example, for the 78-year case, instead of a pre-tax NPV at 7% DROR of $6.8 billion and IRR of 14.5 percent, a decrease in metals prices of 20 percent for both copper and gold would result in a pre-tax NPV at 7% DROR of approximately $2.0 billion and IRR of 10.5 percent.

Table 7 compares the metal prices used in the Waldrop 2011 PA with current metals prices. At the time of the Waldrop 2011 PA, current metals prices still reflected the previous decade's metals commodity super-cycle with then current prices for all but rhenium and palladium

showing a significant increase over what was then predicted to be long-term metals prices. The current prevailing metals prices (April 15, 2019, http://www.infomine.com/investment/metal-prices/) show how metals prices have decreased since 2011 (except for palladium).

Table 7. Proposed Pebble Project Metals Price Assumptions

Metal	Unit	Long-Term Metal Prices (Wardrop 2011 PA)	Prevailing Metal Prices (Wardrop 2011 PA)	Current Prevailing Metal Prices (April 2019)
Copper	$/lb.	2.50	4.00	2.95
Gold	$/oz.	1,050	1,350	1,296
Molybdenum	$/lb.	13.50	15.00	12.46
Silver	$/oz.	15.00	28.00	15.00
Rhenium	$/kg	3,000	3,000	2,841
Palladium	$/oz.	490	490	1,362

$/kg = US dollar per kilogram $/lb. = US dollar per pound $/oz. = US dollar per ounce

Cortez et al (2018)[2] identify and discuss various means of forecasting mineral commodity prices and suggest that traditional approaches that have used econometric, stochastic-Gaussian, and time series techniques are not suitable to represent the "dynamic behavior and time related nature" of metals commodity markets. As noted by the authors, ". . . historical data do not guarantee accurate predictions, as there is no certainty that past events will be repeated in the future at the same intervals and intensity."

Conclusions

Metals prices are a significant risk factor for the proposed Pebble Project. Depending on the timing, particularly during the initial years of project development, lower metals prices could have a significant impact on the economic feasibility of the proposed Pebble Project. This scenario was prevalent following a previous peak in metals prices in the early 1970's that sparked several large projects with unprecedented capital costs, only to see those projects fail when lower metals prices prevailed for a period from project outset over several years resulting in an inability of the mining companies to continue to pay project debt. Examples include Pegasus Gold's Mt Hamilton project in Australia that led to the bankruptcy of the entire company in 1998 and the economic failure, after less than one year, of operations in 1983 of the

[2] Cortez, C.A.Tapia,S.Saydam, J. Coulton, C.Sammut, Alternative techniques for forecasting mineral commodity prices, International Journal of Mining Science and Technology, Volume 28, Issue 2, March 2018, Pages 309-322. https://www.sciencedirect.com/science/article/pii/S2095268616302634

Copper Flat Project in New Mexico. Given the extremely high capital costs for the proposed Pebble Project combined with uncertainty as to the timing and price of future demand for metals commodities, the proposed Pebble Project carries a high risk of economically failing, particularly in the first 5 to 10 years of the project's life. It should be noted that an initial failure would not preclude the initial operator from undergoing bankruptcy reorganization, or a second operator from taking over the mining operations out of bankruptcy, particularly if the capital debt load was renegotiated with creditors.

Capital and Operating Costs

The issue of capital cost overruns is widely acknowledged in the mining industry and has been the cause of either delays or abandonment of a several projects. Operating cost issues are similarly acknowledged in the mining industry, and these problems are often times difficult to predict, particularly where locations are remote, and conditions are challenging. Even common tasks, such as those proposed for the proposed Pebble Project, associated with mining (open pit) and processing (grinding and flotation) carry inherent risks associated with the estimation of capital and operating costs. For example, Export Development Canada[3] reported in 2015 that for mining projects capital costs were typically exceeded by 37 percent. According to a mining industry survey[4] of projects with capital budgets exceeding US$1 billion, capital projects on average run 62 percent over budget and 50 percent of these projects reported delays. The survey noted, "despite care planning, overruns and delays were common."

As a case in point, the Pascua-Lama project in Chile was originally expected to cost no more than $3 billion when construction was approved in 2009. Like the proposed Pebble Project, the Pascua-Lama project faced permitting challenges and strong and organized opposition by local indigenous communities. After investing $5 billion in the project, the capital cost had escalated to more than $8.5 billion, and in 2013 Barrick stopped the project.[5]

The Waldrop 2011 PA examined capital and operating cost sensitivity. For the 78-year case, instead of a pre-tax NPV @7% DROR of $6.8 billion and IRR of 14.5 percent, an increase in

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[3] Export Development Canada, *Capital Cost Overrun and Operational Performance in Mining Industry* (May 2016) http://www.cimmes.org/wp-content/uploads/2016/05/Capital-Cost-Overrun-and-Operational-Performance-in-Mining-Industry-Tin-Lwin-25May2016.pdf

[4] EY, Opportunities to enhance capital productivity (May 2015) https://www.ey.com/Publication/vwLUAssets/EY-opportunities-to-enhance-capital-productivity/%24FILE/EY-opportunities-to-enhance-capital-productivity.pdf

[5] Henry Lazenby, *Barrick to book $429-million Q4 charge on mired Pascua-Lama*, Mining Weekly, Feb. 7, 2018 http://m.miningweekly.com/article/barrick-to-book-429-million-q4-charge-on-mired-pascua-lama-2018-02-07

capital and operating costs of 20 percent would result in a pre-tax NPV @7% DROR of approximately $4.0 billion and IRR of 10.0 percent.

The Excel spreadsheet model was used to estimate the impact that a 100-percent increase in capital costs would have on the project. This might result from increases in capital costs similar to those experienced at Pascua-Lama, but also due to a reduction in the portion of capital costs that would be paid for by other parties versus what is assumed in Waldrop 2011 PA. The detailed spreadsheets showing the information used in this model is provided as Attachment 5A-2 (25-Year Mine Resource Case, Sensitivity Case 1).

For the 25-year case, instead of a pre-tax NPV @7% DROR of $6.8 billion, an IRR of 14.5 percent, and a payback period of 6.2 years, an increase in capital and operating costs of 100 percent would result in a pre-tax NPV @7% DROR of approximately minus $5 (-$0.5) billion, an IRR of 6.4 percent, and a payback period of 12 years.

Conclusions

While the Waldrop 2011 PA identified metal price sensitivity as having the greatest impact on project economics, it is clear given the current trend of significant underestimation of capital and operating costs and considering the likelihood that cost overruns would occur, there is a greater risk from capital and operating cost overruns to the proposed Pebble Project than for any other economic risk factor. It should be noted that this aspect of risk has caused many existing projects to be delayed, and alternative approaches, particularly using underground mining, are being evaluated to reduce initial capital costs and access higher-grade ore to address this challenging situation.

Reclamation and Closure Costs

The Wardrop 2011 PA describes the following in terms of reclamation and closure activities:

- *A comprehensive closure plan has been prepared to ensure protection of the downstream environment, including re-vegetation of embankment faces and exposed tailings surfaces, incorporating wetlands and ponds on the reclaimed tailings surface, and construction of an overflow system.*

- *The Site G TSF presented in this Preliminary Assessment will require monitoring to ensure long-term physical and geochemical stability.*

- *Waste rock dumps will be constructed to a geometry that minimizes closure liability, including siting these facilities within the pit groundwater cone of depression and ensuring suitability for re-vegetation and water management.*

- *PAG waste rock will be fed through the process plant for metal recovery at the end of mine operations, with attendant tailings discharged into the open pit. Once PAG waste rock has been removed, the base will either be removed for in-pit disposal or covered with soil and revegetated.*

- *Remaining NAG waste rock piles will be covered with soil and re-vegetated.*

- *At closure, the tailings storage facility will be reclaimed. During this period, all water will be diverted to the open pit to allow it to fill to a specified level to ensure ongoing groundwater flow into the open pit. Thereafter, water levels will be maintained by treating inflow and discharging it as during operations.*

Some additional descriptions of reclamation and closure are provided in Section 18.4.6 Conceptual Mine Reclamation and Closure Plan of the Waldrop 2011 PA.

According to the Section 18.5.11 Mine Closure, "Closure costs are not included in the estimate but are covered in the financial section." According to Section 18.8.2, "For financial evaluation purposes, it is assumed that the Pebble Partnership will provide equal payments over the estimated mine life under each development case and that any shortfall between the accumulated funds within the reclamation trust and the reclamation liability will be made whole with financial assurance in the form of a letter of credit. Funds contributed to the reclamation trust are assumed to earn a real return of 4.3%."

As the actual reclamation costs and accruals were not included in Wardrop 2011 PA, these costs were also not included in the initial Excel spreadsheet model. A preliminary reclamation and closure financial assurance cost estimate, performed by this author, suggests that the total surface reclamation costs would be $0.6 billion, and the net present value (NPV) of long-term water treatment, monitoring, and maintenance would be $0.8 billion; therefore, the total estimated reclamation and closure cost would be $1.4 billion.

Conclusions

It is anticipated that regulatory agencies will require the total financial assurance amount for reclamation and closure to be posted prior to permitting the proposed Pebble Project, or at

least prior to the initiation of construction. This financial assurance liability represents additional capital costs and operating costs beyond the costs that appear to have been included in the Excel spreadsheet model. While the financial assurance costs might not have the same level of impact as metals prices or capital and operating costs, the cost of providing financial assurance for reclamation and closure will have a substantial impact on project economics; therefore, these costs pose significant economic risk.

Potential Alternative Development Plans for the Proposed Pebble Project

As noted in the Wardrop 2011 PA, the report was prepared exclusively on behalf of NRML. The report further states:

> *"Pebble Partnership continues to undertake detailed engineering studies and project planning toward the completion of a Prefeasibility Study for the Pebble Project, and that no decision has been taken by the Pebble Partnership to seek permits for the project as described in this Preliminary Assessment. Recommendations within this Preliminary Assessment will be provided to the Pebble Partnership to guide further technical and engineering studies toward the completion of a Prefeasibility Study for the Pebble Project."*

Despite the suggestion that a prefeasibility study would be conducted to guide the proposed plan for permitting, no prefeasibility study has been proffered to the public or regulatory agencies for the current proposed plan of development included in the permit application for the proposed Pebble Project.

Review of the Wardrop 2011 PA and NDML 2018 TR suggests that two alternative scenarios for development exist that are highly likely but have not been evaluated in sufficient detail. The first alternative, which is due to the specifics of the deposit, is for underground mining methods to be used to supplement and/or replace open pit mining at some point in the future – potentially in less than 25 years. The second alternative, which would address the relatively low rate of return for the proposed project is proposed in the Wardrop 2011 PA. This alternative is for production to be increased from the proposed rate of 67M – 86M tons per year (184,000 to 236,000 tons per day) to a substantially higher rate. These two alternatives are further addressed in the following sections.

Underground Mining Alternative

Like the 25-year case in the DEIS, the 25-year Investment Decision Case in the Wardrop 2011 PA was intended to "mine near surface ore for rapid payback" and "This initial phase of mining will process about two billion tons of ore or less than 20% of the total Pebble mineral resource."

The 45-year case was selected as the "Reference Case" for the Wardrop 2011 PA "due to its enhanced level of development of the Pebble mineral resource within a timeframe that makes a significant contribution to the project's Net Present Value (NPV)," and the 78-year case, which would result in mining 55 percent of the total resources, was used to "assess the long-term value of the project."

With respect to future development methods, the Wardrop 2011 PA suggests that "While it's certain that near-surface mineral resources within the western portion of the Pebble deposit will be most efficiently developed through open pit methods, underground mining (in particular, block caving) remains an economically viable option at long-term metal prices for developing the deeper and higher-grade resources in the eastern portion" and "it is expected that additional underground investigations will be undertaken during the initial 25 years of production." The report reflects this possibility and atypically includes both an open pit mining plan for the three scenarios considered and an underground mine plan of equal detail.

Conclusions

It is rare for a mining company to perform a feasibility analysis that does not contemplate exploitation of the entire resource. The Wardrop 2011 PA is constrained to the use of open pit mining methods and may represent the maximum reasonable extent to which the proposed Pebble Project could be developed using open-pit mining methods. Given that this would only result in the development of 55 percent of the total resources with the remaining resources open and accessible at depth, it is logical to assume highly probable that underground mining would take place if the remainder of the resources were to be developed in the future. However, given this likelihood, it is also possible that underground mining could be used earlier to develop part of the proposed open pit mining, which is why detailed information on the underground mining alternative was provided in the Wardrop 2011 PA.

As detailed cost information is not available, it is not possible to do an economic evaluation of underground mining based on the Wardrop 2011 PA. However, underground mining can be significantly less capital intensive, and if higher grade ore can be developed, underground mining can be more profitable than open pit mining. This can be seen at other major proposed projects with similar capital constraints. For example, the KSM Project in British Columbia,

Canada, initially planned to develop an open pit mine. This initial approach may be replaced with an alternative development plan for underground mining to improve initial project economics.[6] Based on the information available, there is an equally high probability that if the proposed Pebble Project is permitted and ultimately developed, the majority of the resource will be developed using underground mining methods, and underground mining could potentially be part of the initial mining of the resource to reduce capital costs and access higher grade ore early in project development.

Increased Production Rate Alternative

The economics of scale are highly evident in modern mining projects with the throughput of mines prior to the 1960's being limited to several thousand tons of ore per day at a maximum using underground or open mining methods to today's mega-mines which can mine at rates greater than one million tons per day and process greater than 400,000 tons per day. In the U.S., increases in production rates, provided they are not accompanied by increases in impacts such as area of land disturbed, are typically allowed without major modifications to the existing mine permit, which is based on a lower production rate used in the initial proposal and permit application.

The Wardrop 2011 PA evaluations are based on long-term metals prices and indicated an IRR ranging from 13.4 percent for the 25-year case, 14.2 percent for the 45-year case, and 14.5 percent for the 78-year case. It is important to note that an IRR of 13.4 percent is considered a low to moderate return for a metals mining project, and many mining companies set a target of at least 30 percent, and oftentimes 40 percent, for the IRR on a proposed project. This relatively high IRR is set to account for the sensitivity and volatility of metals mining projects as identified previously in this memorandum.

It is also important to note that due to the time value of money, only a slight improvement is realized by extending the project life from 25 years to 45-years to 78-years. Economic analysis shows that the only way to improve the return (IRR) on a fixed asset such as a mineral resource, other than "high-grading" that might occur using underground mining, is for the scale (production rate) of the project to be increased.

The Excel spreadsheet model was used to estimate the impact that a doubling of the project production rate (100-percent increase) would have on the project. Engineering cost estimation

[6] Seabridge Gold, Featured Projects: KSM, Courageous Lake, Iskut http://seabridgegold.net/projects.php

rule-of-thumb factors of 1.6 times the capital costs and 0.8 times the operating cost for doubling capacity were used to generate the cost estimates and economic forecasts. The detailed spreadsheets showing the information used are provided as Attachment 5A-2 (39-Year Mine Resource Case, Sensitivity Case 2).

Using the 78-year resource at double the production rate results in a 39-year mine plan. The results are summarized in Table 8 For the double production case, instead of a pre-tax NPV @7% DROR of $6.8 billion, an IRR of 14.5 percent, and a payback period of 6.2 years; a two-fold increase in the production rate would result in a pre-tax NPV @7% DROR of $21.2 billion, an IRR of 22 percent, and a payback period of 3.2 years.

Table 8. Wardrop 2011 PA 75-Year Case and Double Production (39-Year) Case Long-Term Metals Prices

Description	Units	75-Year Case Wardrop 2011 PA	39-Year Case
NPV @ 0% DROR	$M	87,329	103,772
NPV @ 5% DROR	$M	12,941	32,309
NPV @ 7% DROR	$M	6,812	21,164
NPV @ 8% DROR	$M	4,964	17,221
NPV @ 10% DROR	$M	2,545	11,451
IRR	%	14.5	22
Payback	years	6.2	3.2

$M = millions of US dollars
DROR = discounted rate of return
IRR = internal rate of return
K&A = Kuipers & Associates
NPV = net present value
PA = Preliminary Assessment

Conclusions

Given the present marginal project economics, it is highly likely that the proposed Pebble Project will need to consider increasing the production rate beyond the rates contemplated in the 2011 Wardrop PA as a means of improving project economics. It would not be unusual for the increased production rate to be proposed after permitting is completed but before construction is initiated.

SUMMARY OF EXPERIENCE

Over 35 years of experience in mining and environmental process engineering design, operations management, regulatory compliance, waste remediation, reclamation and closure, and financial assurance. Over 20 years of experience providing technical assistance to public interest groups and tribal, local, state and federal governments on technical aspects of mining and environmental issues.

EDUCATION

Montana College of Mineral Science and Technology, B.S. Mineral Process Engineering, 1983.

PROFESSIONAL REGISTRATION

Professional Engineer (PE Mining/Minerals): Colorado (No. 30262), Montana (No. 7809 & Corp. No. 197)

PROFESSIONAL EXPERIENCE

1996 to Present **Kuipers & Associates/J. Kuipers Engineering, Butte, MT.**

- *ABN AMRO Bank, Netherlands*: Consulting Engineer, confidential mine evaluation.
- *Amigos Bravos, Taos, NM*: Consulting Engineer, Molycorp Questa Mine, technical review committee and working group member in reclamation and closure/closeout permitting and bonding process.
- *Anaconda Deer Lodge County, MT*: Consulting Engineer/Project Manager, Anaconda Superfund Site, provide technical services related to institutional controls, property conveyance and redevelopment, property and facility operation and maintenance, review of regulatory documents, renewable energy development, air and water monitoring and other tasks related to county involvement in Superfund activities.
- *Bannock Technologies, Pocatello, ID*: Consulting Engineer, Shoshone Bannock Tribe mining oversight project studies.
- *Blackfoot Legacy, Lincoln, MT:* Consulting Engineer, McDonald Project, review of project feasibility and environmental issues.

- *Border Ecology Project, Santa Fe, NM:* Consulting Engineer, Cananea Project (Mexico), consulting engineer mine reclamation and closure planning.
- *Cabinet Resource Group, Noxon, MT*: Consulting Engineer, Rock Creek Project, review of proposed tailing impoundment.
- *Clark Fork River Technical Advisory Committee, Missoula, MT*: Technical Advisor, Clark Fork River and Milltown Reservoir Operable Units, Upper Clark Fork Basin Superfund Sites.
- *Center for Science in Public Participation, Bozeman, MT:* See separate description below.
- *Citizens' Technical Environmental Committee, Butte, MT:* Technical Advisor, Butte-Silver Bow Site Operable Units, Upper Clark Fork Basin Superfund Sites.
- *Cottonwood Resource Council, Big Timber, MT:* Consulting Engineer, Lodestar Mine and Mill, review of operating and MPDES permits, financial assurance and operations data.
- *Earthjustice, Bozeman, MT:* Consulting Engineer, Montanore and Rock Creek Projects permitting process.
- *Earthworks, Washington, D.C.:* Project Manager and co-author, Water Quality Predictions and NEPA/EIS Studies.
- *Environmental Defender Law Center, Bozeman, MT*: Expert Witness and Consulting Engineer, Boliden Promel, Chile arsenic waste disposal.
- *Gila Resources Information Project, Silver City, NM:* Consulting Engineer, Phelps Dodge Chino, Cobre and Tyrone Mines, reclamation and closure/closeout permitting and bonding process.
- *Great Basin Mine Watch, Reno, NV:* Expert Witness and Consulting Engineer, various NV projects, permitting and reclamation and closure/closeout permitting and bonding process.
- *Great Lakes Indian Fish and Wildlife Commission, Odinah, WI*: Gigotec Project and Polymet Project permitting.
- *ICF International, Stafford, VA*: Consulting Engineer, 108(b) rulemaking technical support contract including financial assurance cost estimation model evaluations.
- *Idaho Conservation League, Boise, ID*: Consulting Engineer, Atlanta Mine water treatment and permitting.
- *IEc, Boston, MA*: Consulting Engineer, mining and financial assurance technical support.
- *Institute for Governance & Sustainable Development, Washington, DC:* Consulting Engineer,

reclamation and closure and financial assurance, U.S. Chile Mining Financial Assurance Seminar.

- *Johnson County, KS:* Consulting Engineer, Sunflower Limestone Mine reclamation plan and financial assurance.
- *Little Salmon Carmacks First Nation, Yukon Territory, Canada*: Expert Witness and Consulting Engineer, Carmacks Copper Project.
- *Mining Watch Canada:* Consulting Engineer MEND Tailings Guide Review; Ecuador Mines Evaluations.
- *Minnesota Center for Environmental Advocacy, Saint Paul, MN:* Consulting Engineer, PolyMet NorthMet Project, review permits, reclamation and closure, financial assurance, tailings facilities.
- *Montana Attorney Generals Office, Helena, MT:* Consulting Engineer, assist in defense of I-137 Open Pit Cyanide Mine Ban appeals.
- *Montana Department of Environmental Quality, Helena, MT*: General Contractor, Pony Mill Site Reclamation.
- *Montana Environmental Information Center, Helena, MT and National Wildlife Federation, Missoula, MT*: Expert Witness and Consulting Engineer, Golden Sunlight Mine, EIS Review and assist appeal of State operating permit.
- *Montana Environmental Information Center, Helena, MT*: Expert Witness, Bull Mountain Coal Mine appeal.
- *Montana Trout Unlimited, Missoula, MT*: Consulting Engineer, Trout Unlimited's Four Mines Campaign, review and provide technical assistance on McDonald, Crandon, New World and Rock Creek Mines.
- *Montana Trout Unlimited, Missoula, MT*: Consulting Engineer, I-147 initiative campaign; Black Butte Copper Proposal; Beal Mountain Mine Remediation.
- *Multicultural Alliance for a Safe Environment, Santa Fe, NM*: Consulting Engineer and Expert Witness, Homestake Uranium Mill and Mt Taylor Mine.
- *Natural Resources Defense Council*; New York State: Consulting Engineer, review of Oil & Gas Draft EIS.
- *New Mexico Environmental Law Center, Santa Fe, NM*: Consulting Engineer, Oglebay Norton

Mica Mine reclamation and financial assurance; New Mexico Environment Department Copper Rules Stakeholder Process.

- *Nez Perce Tribe Fisheries Department, McCall, ID*: Consulting Engineer, Midas Gold Stibnite Project permitting.
- *Northern Plains Resource Council, Cottonwood Resource Council, Stillwater Protective Association, Billings. MT:* Consulting Engineer, Stillwater Mining Company Nye and East Boulder Mines, facilitate and perform technical aspects of Good Neighbor Agreement.
- *Northern Plains Resouce Council, Billings, MT; Wyoming Outdoor Council, Sheridan, WY:* Consulting Engineer, Montana Statewide and Wyoming Powder River Basin Coal Bed Methane EIS.
- *Northern Plains Resouce Council, Billings, MT:* Project Manager and co-author, Coal Bed Methane Produced Water Studies.
- *Northern Alaska Environmental Council, Fairbanks, AK:* Consulting Engineer, Pogo Mine NPDES permit negotiations.
- Patagonia Area Resource Alliance, Patagonia, AZ: Consulting Engineer, Arizona Mining, Remediation Plans
- *Picuris Pueblo, Penasco, NM:* US Hill Mica Mine Reclamation Plan and financial assurance cost estimate and site reclamation project management.
- *Powder River Basin Resource Council, Sheridan, WY/Steven Adami, Buffalo, WY:* Expert Witness, Kennedy Oil IMADA POD appeals.
- *Rock Creek Alliance, Missoula, MT:* Expert Witness and Consulting Engineer, Rock Creek and Montanore Mines permitting.
- *Selkirk First Nation, Yukon Territory, Canada:* Expert Witness and Consulting Engineer, Minto Mine Project reclamation and closure and financial assurance; Casino Mine Proposal permit review.
- *Sheep Mountain Alliance, Telluride, CO*: Expert Witness and Consulting Engineer, Silver Bell Tailings remediation.
- *Shoshone-Paiute Tribes of the Duck Valley Reservation, NV:* Consulting Engineer, Rio Tinto Mine Reclamation and Closure.
- *Sierra Club and Mineral Policy Center:* Expert Witness, Cripple Creek and Victor Mining

Company Clean Water Act case.

- *SKEO, Charlottesville, VA*: Consulting Engineer, mining and financial assurance technical support contract and EPA Region NEPA review and financial assurance support.
- *Southern Environmental Law Center, Charleston, SC*: Consulting Engineer, Haile Gold Mine permitting.
- *Systems Research and Applications Corporation, Fairfax, VA:* Consulting Engineer, mine cleanup and financial assurance guidelines subcontract to EPA.
- *Tohono O'odham Nation, San Xavier District, AZ:* Consulting Engineer, Mission Mine reclamation plan and financial assurance.
- *Trust for Public Lands, San Francisco, CA:* Consulting Engineer, Viceroy Castle Mountain Mine, evaluated pit backfill and reclamation alternatives for settlement agreement trust fund determination.
- *Tsilhqot'in National Government, Williams Lake, BC, Canada*: Consulting Engineer and Expert Witness, New Prosperity Project permitting.
- Turner Ranch Properties, Ladder Ranch, NM: Consulting Engineer Copper Flat Project Permitting, Expert Witness related water rights case.
- *Walz and Associates, Albuquerque, NM:* Expert Witness and Consulting Engineer, assist in defense of New Mexico Environment Department and Mining and Minerals Division permitting and takings case (Manning v. NM).
- *Western Organization of Resource Councils, Billings, MT:* Oil and gas reclamation and financial assurance guide.
- *Western Resource Advocates, Salt Lake City, UT*: Expert Witness and Consulting Engineer, Red Leaf Resources oil shale project permitting.
- *Williams Lake and Soda Creek Indian Bands, British Columbia, Canada:* Consulting Engineer, Mount Polley Tailings Facility breach investigations and mine reopening permitting.

1997 to 2005 **Center for Science in Public Participation, Bozeman, MT.**

- *Canadian Earthcare Society, Vancouver, BC*: Consulting Engineer, Brenda Mine, assist appeal of reclamation and closure permit.

- *CEE Bankwatch, Budapest, Hungary*: Consulting Engineer, Rosario Montana Mine (Romania), economic feasibility study of mine proposal.
- *Friends of the Similkameen, Hedley, BC*: Consulting Engineer, Candorado Mine, assist appeal of reclamation and closure permit.
- *Fort Belknap Tribal Council and Environment Department, Fort Belknap, MT*: Consulting Engineer, Zortman and Landusky Mines, Alternative Reclamation and Closure Plan, multiple accounts analysis working group member and technical advisor during supplemental environmental impact statement.
- *Guardians of the Rural Environment, Yarnell, AZ*: Consulting Engineer, Yarnell Project, EIS review and assist appeal of State operating permit.
- *Mineral Policy Center, Washington, D.C.*: Technical Advisor on general mining issues and Author of MPC Issue Paper.
- *National Wildlife Federation, Boulder, CO*: Consulting Engineer authoring report on Hardrock Mining Reclamation and Closure Bonding Practices in the Western United States.
- *Sakoagan Chippewa Tribes, Mole Lake Reservation, Wisconsin*. Consulting Engineer, Crandon Project, permitting process review.

1993 - 1995 **Denver Mineral Engineers, Inc., Littleton, CO.**

- Manager, Process Engineering Department.
- Manager, Mining and Environmental Wastewater Treatment Program
- *Arrowhead Industrial Water Co., San Jose, CA*: Project Manager, evaluation of reverse osmosis for mine wastewater treatment.
- *Barrick Goldstrike, USA, Elko, NV*: Project Engineer, engineering design, construction and installation of 1.5 M oz/year stainless steel electrowinning system.
- *Battle Mountain Gold, Co., Battle Mountain, NV*: Project Manager, evaluation, pilot testing, and preliminary feasibility study of wastewater treatment options for groundwater remediation of Fortitude Mine tailings area.
- *Commerce Group Corporation, Milwaukee, WI*: Project Manager, San Sebastian Gold Project, El Salvador.

- *Independence Mining Corp, Jerritt Canyon, NV*: Project Manager, technical evaluation and feasibility study of column flotation for beneficiation of refractory ores.
- *Kennecott Utah Copper, Bingham Canyon, UT*: Project Manager, design and construct stainless steel solvent extraction mixer settlers for prototype SX/EW plant.
- *Israeli Chemical Corp., Beersheeba, Israel*: Project Manager, evaluation of bromine as an alternative to cyanide gold leaching and prototype design.
- *Marston and Marston, St Louis, MO*: Project Manager, Kommunar Gold Mill Modernization Project, Kommunar, Siberia, Russia (CIS) and Suzak Polymetal Leach Circuit Evaluation and Feasibility Study, Kazakhstan (CIS).
- *Nevada Goldfields Mining Co., Denver, CO*: Project Manager, Nixon Fork Mine Preliminary Engineering Design and Feasibility Study, Concentrate Marketing Study, and environmental permitting studies.
- *Southern Pacific Railroad, Denver, CO*: Project Manager, design, construction and installation of dissolved air flotation wastewater treatment system.

1991 - 1992 **Western States Minerals Corp.**

- Project Manager, Northumberland Gold Mine, Round Mountain, NV.
- Corporate Senior Metallurgist, Wheat Ridge, CO. Engineering design and feasibility evaluations.

1986 - 1991 **Western Gold Exploration and Mining Co. (WESTGOLD)/Minorco**

- Corporate Senior Metallurgist / Project Manager, WESTGOLD, Golden, CO. Acquisitions and engineering design and feasibility evaluations, corporate acquisitions and business development group.
- Project Manager, Shamrock Resources (WESTGOLD Subs.), Reno, NV. Evaluation, engineering design and feasibility study, and prototype plant operation of refractory gold ore bioleaching technology program.
- Project Manager, Balmerton Mine, Ontario: Refractory gold ore bioleaching project and feasibility evaluation.

- Project Engineer, Johannesburg South Africa: Evaluation of Anglo American Corp. Pumpcell Technology.
- Mill Superintendent, Austin Gold Venture (WESTGOLD), Austin, NV.
- Shift Foreman, Inspiration Consolidated Copper Co, Globe, AZ.

1984 - 1985 **Canyonlands 21st Century Corporation**

- Director of Metallurgy, Blanding, UT. Project Manager, Jarbidge, NV.

1983 - 1984 **Cumberland Mining Corporation**

- Mill Superintendent / Head Metallurgist, Basin and Virginia City, MT.

1974 – 1980 **Huckaba Construction**

- Summer employment as Underground and Surface Miner, Millwright, Mill Operator, Fire Assayer, Whitehall and Cooke City, MT. Family owned small mining operation.

PRESENTATIONS and PUBLICATIONS

- *Hardrock Mine Financial Assurance Training Workshop*, National Tribal Mining Workgroup, McCall, ID, October 11-12, 2017.
- *The Development of Remedial Design Options for the Questa Mine Waste Rock Piles using a Collaborative Approach*, Kuipers, J. et al, Tailings and Mine Waste 2017, Nov 5-8, Banff, Alberta, Canada
- *Mine Reclamation and Closure Planning: Reducing the Risk from Mining Influenced Water, Mine Financial Assurance: Addressing the Cost of Mining Influenced Water,* U.S. EPA The Mining Lifecycle: Tribal Engagement and Responsibility Conference, Phoenix, AZ, November 2-4, 2016.
- *Mine Tailings Fundamentals: Current Technology and Practice for Mine Tailings Facilities Operations and Closure*, U.S. EPA Contaminated Site Clean-Up Information Webinar Series May 19-20, 2015

- *North American Indigenous Peoples Perspectives on the Reliability of Mine Water Technology*, International Mine Water Association, Golden, CO, 2013 Annual Conference.
- *Financial Assurance Regulations and Cost Estimation at US Hardrock Mines,* U.S. Chile Mining Financial Assurance Seminar, US Office of Surface Mining and Environmental Protection agency and Chilean Ministry of Mining, Santiago, Chile, May 2012.
- *Mining Reclamation and Closure Regulations and Best Practices*, 2012 International Conference on Mining in Mindanao, Ateneo de Davao University, Davao City, Philippines, January 26-27, 2012.
- *Beyond the Global Acid Rock Drainage Guide,* Lake Superior Binational Program, Mining in the Lake Superior Basin Webinar Series, Environmental Impacts of Mining in the Lake Superior Basin, October 27, 2009
- *Characterizing, Predicting, and Modeling Water at Mine Sites,* California Environmental Protection Agency, California Water Board Training Academy**,** May 18 - 21, 2009
  Mitigating Mining Impacts: Principles and Practices, Lake Superior Binational Program, Mining in the Lake Superior Basin Webinar Series, Environmental Impacts of Mining in the Lake Superior Basin, March 24, 2009
- *Long-term Requirements & Financial Assurance at Superfund & Other Mine Sites*, Mine Design, Operations and Closure Conference, Fairmont Hot Springs, MT, April 2008.
- *The Effects of Coalbed Methane Production on Surface and Ground Water Resources*, Committee on Earth Resources, Board on Earth Sciences and Resources, National Research Council, Meeting on the Status of Data and Management Regarding the Effects of Coalbed Methane Production on Surface and Ground Water Resources, Denver, Colorado, April 2008.
- *Reclamation Planning and Financial Assurance Practice in the United States,* Kamchatka Mining Conference, Kamchatka Oblast People's Council of Deputies, the Committee on Ecology and Resource Management of Kamchatsky Krai, the Rosprirodnadzor Division of Kamchatka Oblast and Koryaksky Autonomous Okrug, the Division for Minerals Management for Kamchatka Krai, and the Kamchatka Oblast Council of the All-Russia Society for Nature Protection, Petropavlovsk-Kamchatsky, Russia, October 2007.
- *The Good Neighbour Agreement: A Proactive Approach to Water Management through Community Enforcement of Site-Specific Standards*, w Sarah Zuzulock, Greener Management International, Issue 53, Spring 2006, Greenleaf Publishing. 2007.

- *Sustainable Development at the Anaconda Superfund Site,* Mine Design, Operations and Closure Conference, Fairmont Hot Springs, MT, April 2007.
- *Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements* with A. Maest, K. MacHardy, G. Lawson. *Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art* with A. Maest, Final Report Release December 2006.
- *Reclamation and Bonding in Copper Mining,* U.S. EPA Hardrock 2006: Sustainable Modern Mining Applications, Tucson, Arizona, November 2006.
- *Sustainable Development at the Anaconda Superfund Site:* U.S. EPA Hardrock 2006: Sustainable Modern Mining Applications, Tucson, Arizona9, November 2006.
- *U.S. Perspective on Financial Assurance for Mine Cleanup*, presented at International Bar Association Conference, Chicago, Illinois, September 2006.
- *Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements* with A. Maest, K. MacHardy, G. Lawson, presented at Mine Design, Operations and Closure Conference, Fairmont Hot Springs, MT, April 2006.
- *Predicted Versus Actual Water Quality at Hardrock Mine Sites: Effect of Inherent Geochemical and Hydrological Characteristics* with A. Maest, K. MacHardy, and G. Lawson at International Congress on Acid Rock Drainage (ICARD), March 2006, St. Louis, MS.
- *Oil, Gas and Coal Bed Methane Reclamation and Financial Assurance Guide*, with Kimberley MacHardy and Victoria Lynne, November 2005; 12th International Petroleum Environmental Conference, Houston, TX.
- *Approaches to Abandoned Mine Site Assessment and Remedy Selection in the U.S.,* NOAMI Workshop on Assessing Liabilities and Funding Options, November 2, 2005 Ottawa, Canada
- *Filling the Gaps: How to Improve Oil and Gas Reclamation and Reduce Taxpayer Liability*, Kuipers & Associates for Western Organization of Resource Councils, August 2005.
- *The Environmental Legacy of Mining in New Mexico*, Mining in New Mexico: The Environment, Water, Economics and Sustainable Development, New Mexico Bureau of Geology and Mineral Resources, Decision-Makers Field Conference 2005, L. Greer Price et al Editors.

- *Financial Assurance and Bonding*, 2005 Decision-Makers Field Conference, Mining in New Mexico: The Environment, Water, Economics and Sustainable Development, New Mexico Bureau of Geology and Mineral Resources, May 2005.
- *Evaluation of the NEPA Process for Estimating Water Quality Impacts at Hardrock Mine Sites* with A. Maest, K. MacHardy, G. Lawson, for Earthworks, presented at Society of Mining Engineers Annual Conference, Salt Lake City, UT, March 2005 and Mine Design, Operations and Closure Conference, Polson, MT, April 2005.
- *Evaluation of Methods and Models Used to Predict Water Quality at Hardrock Mine Sites: Sources of uncertainty and recommendations for improvement* with A. Maest, C. Travers and D. Atkins, for Earthworks, presented at Society of Mining Engineers Annual Conference, Salt Lake City, UT, March 2005 and Mine Design, Operations and Closure Conference, Polson, MT, April 2005.
- *Coal Bed Methane-Produced Water: Management Options for Sustainable Development,* co-authored with K. MacHardy, W. Merschat and T. Myers, presented at Coal Bed Natural Gas Research, Monitoring and Applications Conference, Laramie, WY, August 2004; 11th International Petroleum Environmental Conference, Albuquerque, NM, October 2004; Northern Plains Resource Council Annual Meeting, November 2004.
- *Technology-Based Effluent Limitations for Coal Bed Methane-Produced Wastewater Discharges in the*

  Powder River Basin of Montana and Wyoming, Northern Plains Resource Council, Billings, MT, November 2004.
- *Financial Assurance Guidelines for Hardrock Mine Cleanup*, Mine Design, Operations and Closure Conference, Polson, MT, April 2004.
- *Introduction to Mine Water Treatment*, Mine Discharge Water Treatment Short Course, Mine Design, Operations and Closure Conference, Polson, MT, April 2004.
- *Coal Bed Methane: A Design and Process Overview of Production and Produced Water*, presented as short course at Joint Engineers Conference, Helena, MT, November 2003.
- *The Good Neighbor Agreement between Stillwater Mining Company and Northern Plains Resource Councils: An Example of Industry and Citizen Cooperation*, presented as a short course at Joint Engineers Conference, Helena, MT, November 2003.

- *Reclamation and Financial Assurance for Mines on or Impacting Tribal Land*, presented at U.S. EPA Workshop on Mining Impacted Native American Lands, Reno, NV, September 2003.
- *Reclamation and Financial Assurance from a Public Interest Perspective*, presented at U.S. Forest Service National Geofest, Park City, UT, September 2003.
- *U.S. State and Federal Policies on Financial Assurance Forms for Hardrock Mines,* presented at New Mexico Financial Assurance Forum, Santa Fe, NM, May 2003.
- *Public Interest Perspective on Land Application Disposal*, presented at Mine Design, Operations and Closure Conference, Polson, MT, April 2003.
- *Putting a Price on Pollution: Financial Assurance for Mine Reclamation and Closure*, Mineral Policy Center, Washington, D.C., March 2003.
- Testimony to the Subcommittee on Energy and Mineral Resources, Committee on Resources, U.S. House of Representatives, Hearing on "Availability of Bonds to Meet Federal Requirements for Mining, Oil and Gas Projects." Washington, D.C., July 23, 2002.
- *Mine Closure and Financial Assurance: Can the Mining Industry Afford It's Legacy?*, presented at Global Mining Initiative Conference, Toronto, Canada, May 2002.
- *The Role of the Center for Science in Public Participation in Mining Environmental Issues, with Perspective for Regulators and Industry*, presented at Canadian Institute of Mining and Metallurgical Engineers Conference, Vancouver, Canada, May 2002 and U.S. EPA Hardrock Mining Conference, Denver, Colorado, May 2002.
- *The Good Neighbor Agreement between Stillwater Mining Company and the Northern Plains Resource Councils: The Formation and Implementation of a New Approach to Addressing Environmental and Community Relations Issues,* presented at U.S. EPA Hardrock Mining Conference, Denver, Colorado, May 2002.
- *Underground Hard-Rock Mining: Subsidence and Hydrologic Environmental Impacts,* Center for Science in Public Participation, Bozeman, MT, February 2002. Co-authored with S. Blodgett.
- *Review of the Multiple Accounts Analysis Alternatives Evaluation Process Completed for the Reclamation of the Zortman and Landusky Mine Sites*; presented at National Association of Abandoned Mine Lands Annual Conference, Athens, Ohio, August 2001. Co-authored with S.C.Shaw, A.M. Robertson, W.C. Maehl and S. Haight.

- *Full Reclamation and Closure Plan, Phelps Dodge Tyrone Mine, Grant County, NM;* Gila Resources Information Project, Silver City, NM, July 2001. Co-authored with S. Blodgett.
- *Reclamation Bonding for Hardrock Metal Mines Workshop*; presented by CSP2 at Juneau and Fairbanks, AK, July 2001.
- *Full Reclamation and Closure Plan, Phelps Dodge Chino Mine, Grant County, NM;* Gila Resources Information Project, Silver City, NM, June 2001. Co-authored with S. Blodgett.
- *Reclamation Bonding in Montana;* Montana Environmental Information Center, Helena, MT, November 2000. Co-authored with S. Levit.
- *Full Reclamation and Closure Plan, Molycorp Questa Mine, NM;* Amigos Bravos, Taos, NM, May 2000.
- *Hardrock Mining Reclamation and Bonding Practices in the Western United States*: National Wildlife Federation, Boulder, CO, February 2000.
- *An Economic Evaluation of the McDonald Gold Project*; Blackfoot Legacy, Lincoln, MT, February 2000.
- *Restoring the Upper Clark Fork: Guidelines for Action*; Trout Unlimited, Missoula, MT, April 1999. Co-authored with D. Workman, B. Farling and P. Callahan.
- *Alternative Final Reclamation and Closure Plan, Zortman and Landusky Mines, MT:* Indian Law Resource Center, Helena, MT, January 1999.
- *Reclamation Bonding Regulations of Precious Metal Heap Leach Facilities in the Western United States:* Presented at the workshop on Closure, Remediation and Management of Precious Metals Heap Leach Facilities, University of Nevada, Reno, Jan 15, 1999.
- *Wastewater Treatment Methods for Base and Precious Metal Mines*: Public Education for Water Quality Project, Northern Plains Resource Council, Billings, MT, 1996.
- *Bacterial Leaching Pilot Study – Oxidation of a Refractory Gold Bearing High Arsenic Sulphide Concentrate:* Randol Gold Forum, Squaw Valley, 1990. Co-authored with J. Chapman, B. Marchant, R. Lawrence, R. Knopp.
- *Novel Aspects of Gold Recovery Using Column Flotation at Austin Gold Venture*: Gold and Silver Recovery Innovations, Phase IV Workshop, Randol International Ltd, Sacramento, CA, 1989.

Attachment 5A-2. Table of Contents

Item	Description
5A-2a	78-Year Mine Resource Case
5A-2b	45-Year Mine Resource Case
5A-2c	25-Year Mine Resource Case
5A-2d	25-Year Mine Resource Case, Sensitivity Case 1
5A-2e	39-Year Mine Resource Case, Sensitivity Case 2

Abbreviations and Acronyms	
%	percent
$	US dollars
$/lb	US dollars per pound
$/oz	US dollars per ounce
$/kg	US dollars per kilogram
$M	US dollars in millions
Ag	silver
Au	gold
Cu	copper
DROR	Discounted rate of return
IRR	Internal rate of return
K	thousands
kg	kilogram
Kkg	thousands of kilograms
koz.	thousands of ounces
lb.	pounds
M	millions
Mo	molybdenum
Mlb.	millions of pounds
NPV	Net present value
oz.	ounce
oz./t	ounces per metric ton
Pd	palladium
ppm	parts per million
Rh	Rhodium
t	metric ton

Description	Units	2011 Actual	Calculated Total	Year -4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Production																																									
Mining																																									
Ore	t		6,526					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	89	89	89	89	89	89	89	89	89	89
Waste	t		17,247					67	67	67	67	67	95	95	95	95	95	241	241	241	241	241	241	241	241	241	241	241	241	241	241	241	177	177	177	177	177	177	177	177	177
Strip Ratio (Waste/Ore)			2.6					1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Processing																																									
Ore Milled	t	6,528	6,526					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	89	89	89	89	89	89	89	89	89
Cu Grade	%	0.47						0.36	0.36	0.36	0.36	0.36	0.34	0.34	0.34	0.34	0.34	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Au Grade	oz./t	0.0108						0.0112	0.0112	0.0112	0.0112	0.0112	0.0107	0.0107	0.0107	0.0107	0.0107	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Mo Grade	ppm	243						171.1	171.1	171.1	171.1	171.1	158.8	158.8	158.8	158.8	158.8	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3
Cu Recovery	%	88						82	82	82	82	82	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	89	89	89	89	89	89	89	89	89
Au Recovery	%	71						70	70	70	70	70	70	70	70	70	70	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	71	71	71	71	71	71	71	71	71
Mo Recovery	%	89						79	79	79	79	79	82	82	82	82	82	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	90	90	90	90	90	90	90	90	90
Concentrate Production																																									
Cu Au Concentrate																																									
Cu Pounds	Mlb.	53,437	53,346					393	393	393	393	393	427	427	427	427	427	569	569	569	569	569	569	569	569	569	569	569	569	569	569	569	867	867	867	867	867	867	867	867	867
Au Ounces	koz.	50,133	49,810					522	522	522	522	522	547	547	547	547	547	731	731	731	731	731	731	731	731	731	731	731	731	731	731	731	692	692	692	692	692	692	692	692	692
Ag Ounces	koz.	241,719						3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099
Rh Kilograms	Kkg	2,312						30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Pd Ounces	Koz.	1,589						20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mo Concentrate																																									
Mo Pounds	Mlb.	2,835	2,800					18	18	18	18	18	19	19	19	19	19	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	39	39	39	39	39	39	39	39	39
Revenue																																									
Metal Prices																																									
Cu	$/lb.	2.50						2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz.	1,050.00						1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/lb.	13.50						13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz.	15.00						15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg.	3,000.00						3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz.	490.00						490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																																									
Cu	$M		133,366					983	983	983	983	983	1,067	1,067	1,067	1,067	1,067	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168
Au	$M		52,301					548	548	548	548	548	574	574	574	574	574	768	768	768	768	768	768	768	768	768	768	768	768	768	768	768	727	727	727	727	727	727	727	727	727
Mo	$M		37,797					243	243	243	243	243	257	257	257	257	257	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	522	522	522	522	522	522	522	522	522
Ag	$M							42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Rh	$M							80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Pd	$M							9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total Gross Revenue	$M	233,908	233,670					1,905	1,905	1,905	1,905	1,905	2,029	2,029	2,029	2,029	2,029	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548
Realization Charges	$M	-19,938	-19,937					-145	-145	-145	-145	-145	-156	-156	-156	-156	-156	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-311	-311	-311	-311	-311	-311	-311	-311	-311
Net Smelter Revenue	$M	213,970	213,733					1,760	1,760	1,760	1,760	1,760	1,873	1,873	1,873	1,873	1,873	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236
Operating Costs																																									
Operating Cost	$M	-96,063	-96,063				-269	-668	-668	-668	-668	-668	-723	-723	-723	-723	-723	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180
Operating Profit		117,906	117,670				-269	1092	1092	1092	1092	1092	1150	1150	1150	1150	1150	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	2056	2056	2056	2056	2056	2056	2056	2056	2056
Royalties and Local Production Taxes																																									
Tech 4% Pre-Payback, 5% Post-p\Payback			-5,842					-44	-44	-44	-44	-44	-57	-57	-57	-57	-57	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-103	-103	-103	-103	-103	-103	-103	-103	-103
Local Production Taxes (5%)			-6,718	-59	-59	-59	-59	-58	-58	-58	-58	-58	-63	-63	-63	-63	-63	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-148	-108	-108	-108	-108	-108	-108	-108	-108	-108
Gross Profit				-59	-59	-59	-328	991	991	991	991	991	1,030	1,030	1,030	1,030	1,030	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,805	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
Costs																																									
Capital Costs																																									
Mining	$M	-431		-108	-108	-108	-108																																		
Process	$M	-1,058		-265	-265	-265	-265																																		
Molybdenum Saration	$M	-84		-21	-21	-21	-21																																		
Secondary Gold Plant	$M	-161		-40	-40	-40	-40																																		
Infrastructure	$M	-422		-106	-106	-106	-106																																		
Tailings	$M	-294		-74	-74	-74	-74																																		
Pipelines	$M	-98		-24	-24	-24	-24																																		
Access Road	$M	-162		-41	-41	-41	-41																																		
Port infrastructure	$M	-155		-39	-39	-39	-39																																		
Port process	$M	-87		-22	-22	-22	-22																																		
Power generation	$M	-534		-134	-134	-134	-134																																		
Indirect costs	$M	-1,407		-352	-352	-352	-352																																		
Contingency	$M	-866		-216	-216	-216	-216																																		
Sub-Total Capital Costs	$M	-5,757		-1,439	-1,439	-1,439	-1,439																																		
Molybdenum Autoclave	$M	-374		-94	-94	-94	-94																																		
Escalation/De-escalation Adjustment	$M	121		30	30	30	30																																		
Outsourced Infrastructure	$M	1,315		329	329	329	329																																		
Total Capital Costs	$M	-4,695	-4,695	-1,174	-1,174	-1,174	-1,174																																		
Sustaining Capital Costs																																									
Open Pit	$M	-7,225																																							
Processing	$M	-517																																							
Infrastructure	$M	-165																																							
Waste Management	$M	-3,364																																							
Other	$M	-180																																							
Molybdenum Autoclave	$M	-276																																							
Total Sustaining Capital Costs	$M	-11,727	-11,726					-65.2	-65.2	-65.2	-65.2	-65.2	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-900	-96	-96	-96	-96	-96	-96	-96	-96
Total Capital Costs			-16,421	-1,174	-1,174	-1,174	-1,174	-65	-65	-65	-65	-65	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-900	-96	-96	-96	-96	-96	-96	-96	-96
Net Cash Flow			88,689	-1,232	-1,232	-1,232	-1,501	926	926	926	926	926	926	926	926	926	926	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	905	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750
Cumulative Cash Flow				-1,232	-2,465	-3,697	-5,199	-4,273	-3,347	-2,422	-1,496	-571	355	1,281	2,207	3,132	4,058	5,151	6,244	7,336	8,429	9,522	10,615	11,708	12,801	13,894	14,986	16,079	17,172	18,265	19,358	20,451	21,356	23,105	24,855	26,605	28,354	30,104	31,853	33,603	35,353
NPV @ 0% DROR	$M	87,329	88,689																																						
NPV @ 5% DROR	$M	12,941	13,899																																						
NPV @ 7% DROR	$M	6,812	7,526																																						
NPV @ 8% DROR	$M	4,964	5,576																																						
NPV @ 10% DROR	$M	2,545	2,995																																						
IRR	%	14.5	15.2																																						
Payback	years	6.1	6.3																																						
Taxes																																									
Net Cash Flow After Tax																																									

Description	Units	2011	Calculated	Year																																					
		Actual	Total	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
Production																																									
Mining																																									
Ore	t		6,526	89	89	89	89	89	89	89	89	89	89	89	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	82	82	82	82	82	82	82	82	82	82	82	82
Waste	t		17,247	177	177	177	177	177	177	177	177	177	177	115	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	426	426	426	426	426	426	426	426	426	426	426	426
Strip Ratio (Waste/Ore)			2.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Processing																																									
Ore Milled	t	6,528	6,526	89	89	89	89	89	89	89	89	89	89	89	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	82	82	82	82	82	82	82	82	82	82	82	82
Cu Grade	%	0.47		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Au Grade	oz./t	0.0108		0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095
Mo Grade	ppm	243		242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8
Cu Recovery	%	88		89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
Au Recovery	%	71		71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
Mo Recovery	%	89		90	90	90	90	90	90	90	90	90	90	90	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Concentrate Production																																									
Cu Au Concentrate																																									
Cu Pounds	Mlb.	53,437	53,346	867	867	867	867	867	867	867	867	867	867	867	735	735	735	735	735	735	735	735	735	735	735	735	735	735	735	685	685	685	685	685	685	685	685	685	685	685	685
Au Ounces	koz.	50,133	49,810	692	692	692	692	692	692	692	692	692	692	692	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	552	552	552	552	552	552	552	552	552	552	552	552
Ag Ounces	koz.	241,719		3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099
Rh Kilograms	Kkg	2,312		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Pd Ounces	Koz.	1,589		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mo Concentrate																																									
Mo Pounds	Mlb.	2,835	2,800	39	39	39	39	39	39	39	39	39	39	39	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	45	45	45	45	45	45	45	45	45	45	45	45
Revenue																																									
Metal Prices																																									
Cu	$/lb.	2.50		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz.	1,050.00		1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/lb.	13.50		13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz.	15.00		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg.	3,000.00		3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz.	490.00		490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																																									
Cu	$M		133,366	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713
Au	$M		52,301	727	727	727	727	727	727	727	727	727	727	727	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	580	580	580	580	580	580	580	580	580	580	580	580
Mo	$M		37,797	522	522	522	522	522	522	522	522	522	522	522	567	567	567	567	567	567	567	567	567	567	567	567	567	567	567	607	607	607	607	607	607	607	607	607	607	607	607
Ag	$M			42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Rh	$M			80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Pd	$M			9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total Gross Revenue	$M	233,908	233,670	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031
Realization Charges	$M	-19,938	-19,937	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-268	-268	-268	-268	-268	-268	-268	-268	-268	-268	-268	-268
Net Smelter Revenue	$M	213,970	213,733	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763
Operating Costs																																									
Operating Cost	$M	-96,063	-96,063	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881
Operating Profit		117,906	117,670	2056	2056	2056	2056	2056	2056	2056	2056	2056	2056	2056	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	881	881	881	881	881	881	881	881	881	881	881	881
Royalties and Local Production Taxes																																									
Tech 4% Pre-Payback, 5% Post-p\Payback			-5,842	-103	-103	-103	-103	-103	-103	-103	-103	-103	-103	-103	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-44	-44	-44	-44	-44	-44	-44	-44	-44	-44	-44	-44
Local Production Taxes (5%)			-6,718	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-53	-53	-53	-53	-53	-53	-53	-53	-53	-53	-53	-53
Gross Profit				1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	784	784	784	784	784	784	784	784	784	784	784	784
Costs																																									
Capital Costs																																									
Mining	$M	-431																																							
Process	$M	-1,058																																							
Molybdenum Saration	$M	-84																																							
Secondary Gold Plant	$M	-161																																							
Infrastructure	$M	-422																																							
Tailings	$M	-294																																							
Pipelines	$M	-98																																							
Access Road	$M	-162																																							
Port infrastructure	$M	-155																																							
Port process	$M	-87																																							
Power generation	$M	-534																																							
Indirect costs	$M	-1,407																																							
Contingency	$M	-866																																							
Sub-Total Capital Costs	$M	-5,757																																							
Molybdenum Autoclave	$M	-374																																							
Escalation/De-escalation Adjustment	$M	121																																							
Outsourced Infrastructure	$M	1,315																																							
Total Capital Costs	$M	-4,695	-4,695																																						
Sustaining Capital Costs																																									
Open Pit	$M	-7,225																																							
Processing	$M	-517																																							
Infrastructure	$M	-165																																							
Waste Management	$M	-3,364																																							
Other	$M	-180																																							
Molybdenum Autoclave	$M	-276																																							
Total Sustaining Capital Costs	$M	-11,727	-11,726	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176
Total Capital Costs			-16,421	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176
Net Cash Flow			88,689	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	608	608	608	608	608	608	608	608	608	608	608	608
Cumulative Cash Flow				37,102	38,852	40,601	42,351	44,101	45,850	47,600	49,349	51,099	52,849	54,598	56,141	57,684	59,227	60,770	62,313	63,855	65,398	66,941	68,484	70,027	71,570	73,113	74,656	76,198	77,741	78,349	78,958	79,566	80,174	80,782	81,390	81,999	82,607	83,215	83,823	84,431	85,039
NPV @ 0% DROR	$M	87,329	88,689																																						
NPV @ 5% DROR	$M	12,941	13,899																																						
NPV @ 7% DROR	$M	6,812	7,526																																						
NPV @ 8% DROR	$M	4,964	5,576																																						
NPV @ 10% DROR	$M	2,545	2,995																																						
IRR	%	14.5	15.2																																						
Payback	years	6.1	6.3																																						
Taxes																																									
Net Cash Flow After Tax																																									

Pebble Mine Pro Forma
2011 Preliminary Assessment
78-Year Mine Resource Case

Description	Units	2011 Actual	Calculated Total	Year 73	74	75	76	77	78
Production									
Mining									
Ore	t		6,526	82	82	82	82	82	82
Waste	t		17,247	426	426	426	426	426	426
Strip Ratio (Waste/Ore)			2.6	5.2	5.2	5.2	5.2	5.2	5.2
Processing									
Ore Milled	t	6,528	6,526	82	82	82	82	82	82
Cu Grade	%	0.47		0.47	0.47	0.47	0.47	0.47	0.47
Au Grade	oz./t	0.0108		0.0095	0.0095	0.0095	0.0095	0.0095	0.0095
Mo Grade	ppm	243		301.8	301.8	301.8	301.8	301.8	301.8
Cu Recovery	%	88		89	89	89	89	89	89
Au Recovery	%	71		71	71	71	71	71	71
Mo Recovery	%	89		91	91	91	91	91	91
Concentrate Production									
Cu Au Concentrate									
Cu Pounds	Mlb.	53,437	53,346	685	685	685	685	685	685
Au Ounces	koz.	50,133	49,810	552	552	552	552	552	552
Ag Ounces	koz.	241,719		3,099	3,099	3,099	3,099	3,099	3,099
Rh Kilograms	Kkg	2,312		30	30	30	30	30	30
Pd Ounces	Koz.	1,589		20	20	20	20	20	20
Mo Concentrate									
Mo Pounds	Mlb.	2,835	2,800	45	45	45	45	45	45
Revenue									
Metal Prices									
Cu	$/lb.	2.50		2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz.	1,050.00		1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/lb.	13.50		13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz.	15.00		15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg.	3,000.00		3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz.	490.00		490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue									
Cu	$M		133,366	1,713	1,713	1,713	1,713	1,713	1,713
Au	$M		52,301	580	580	580	580	580	580
Mo	$M		37,797	607	607	607	607	607	607
Ag	$M			42	42	42	42	42	42
Rh	$M			80	80	80	80	80	80
Pd	$M			9	9	9	9	9	9
Total Gross Revenue	$M	233,908	233,670	3,031	3,031	3,031	3,031	3,031	3,031
Realization Charges	$M	-19,938	-19,937	-268	-268	-268	-268	-268	-268
Net Smelter Revenue	$M	213,970	213,733	2,763	2,763	2,763	2,763	2,763	2,763
Operating Costs									
Operating Cost	$M	-96,063	-96,063	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881
Operating Profit		117,906	117,670	881	881	881	881	881	881
Royalties and Local Production Taxes									
Tech 4% Pre-Payback, 5% Post-p\Payback			-5,842	-44	-44	-44	-44	-44	-44
Local Production Taxes (5%)			-6,718	-53	-53	-53	-53	-53	-53
Gross Profit				784	784	784	784	784	784
Costs									
Capital Costs									
Mining	$M	-431							
Process	$M	-1,058							
Molybdenum Saration	$M	-84							
Secondary Gold Plant	$M	-161							
Infrastructure	$M	-422							
Tailings	$M	-294							
Pipelines	$M	-98							
Access Road	$M	-162							
Port infrastructure	$M	-155							
Port process	$M	-87							
Power generation	$M	-534							
Indirect costs	$M	-1,407							
Contingency	$M	-866							
Sub-Total Capital Costs	$M	-5,757							
Molybdenum Autoclave	$M	-374							
Escalation/De-escalation Adjustment	$M	121							
Outsourced Infrastructure	$M	1,315							
Total Capital Costs	$M	-4,695	-4,695						
Sustaining Capital Costs									
Open Pit	$M	-7,225							
Processing	$M	-517							
Infrastructure	$M	-165							
Waste Management	$M	-3,364							
Other	$M	-180							
Molybdenum Autoclave	$M	-276							
Total Sustaining Capital Costs	$M	-11,727	-11,726	-176	-176	-176	-176	-176	-176
Total Capital Costs			-16,421	-176	-176	-176	-176	-176	-176
Net Cash Flow			88,689	608	608	608	608	608	608
Cumulative Cash Flow				85,648	86,256	86,864	87,472	88,080	88,689
NPV @ 0% DROR	$M	87,329	88,689						
NPV @ 5% DROR	$M	12,941	13,899						
NPV @ 7% DROR	$M	6,812	7,526						
NPV @ 8% DROR	$M	4,964	5,576						
NPV @ 10% DROR	$M	2,545	2,995						
IRR	%	14.5	15.2						
Payback	years	6.1	6.3						
Taxes									
Net Cash Flow After Tax									

Description	Units	2011 Actual	Calculated Total	Year																																		
				-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Production																																						
Mining																																						
Ore	t		3,761					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	89	89	89	89	89	89	89
Waste	t		7,904					67	67	67	67	67	95	95	95	95	95	241	241	241	241	241	241	241	241	241	241	241	241	241	241	241	177	177	177	177	177	177
Strip Ratio (Waste/Ore)			2.1					1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.0	2.0	2.0	2.0	2.0	2.0
Processing																																						
Ore Milled	t	3,767	3,761					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	89	89	89	89	89	89	89
Cu Grade	%	0.46						0.36	0.36	0.36	0.36	0.36	0.34	0.34	0.34	0.34	0.34	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Au Grade	oz/t	0.011						0.0112	0.0112	0.0112	0.0112	0.0112	0.0107	0.0107	0.0107	0.0107	0.0107	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.011	0.011	0.011	0.011	0.011	0.011
Mo Grade	ppm	214						171.1	171.1	171.1	171.1	171.1	158.8	158.8	158.8	158.8	158.8	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	242.3	242.3	242.3	242.3	242.3	242.3	242.3
Cu Recovery	%	88						82	82	82	82	82	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87	87	89	89	89	89	89	89	89
Au Recovery	%	71						70	70	70	70	70	70	70	70	70	70	72	72	72	72	72	72	72	72	72	72	72	72	72	72	71	71	71	71	71	71	71
Mo Recovery	%	88						79	79	79	79	79	82	82	82	82	82	85	85	85	85	85	85	85	85	85	85	85	85	85	85	90	90	90	90	90	90	90
Concentrate Production																																						
Cu Au Concentrate																																						
Cu Pounds	Mlb.	30,494	29,985					393	393	393	393	393	427	427	427	427	427	569	569	569	569	569	569	569	569	569	569	569	569	569	569	867	867	867	867	867	867	867
Au Ounces	Koz.	30,307	30,152					522	522	522	522	522	547	547	547	547	547	731	731	731	731	731	731	731	731	731	731	731	731	731	731	692	692	692	692	692	692	692
Ag Ounces	Koz.	140,423						1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
Rh Kilograms	Kkg	1,158						15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Pd Ounces	Koz.	907						12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Mo Concentrate																																						
Mo Pounds	Mlb.	1,420	1,361					18	18	18	18	18	19	19	19	19	19	27	27	27	27	27	27	27	27	27	27	27	27	27	27	39	39	39	39	39	39	39
Revenue																																						
Metal Prices																																						
Cu	$/lb.	2.50						2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz.	1,050.00						1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/lb.	13.50						13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz.	15.00						15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg	3,000.00						3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz.	490.00						490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																																						
Cu	$M		74,961					983	983	983	983	983	1,067	1,067	1,067	1,067	1,067	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	2,168	2,168	2,168	2,168	2,168	2,168	2,168
Au	$M		31,660					548	548	548	548	548	574	574	574	574	574	768	768	768	768	768	768	768	768	768	768	768	768	768	768	727	727	727	727	727	727	727
Mo	$M		18,369					243	243	243	243	243	257	257	257	257	257	362	362	362	362	362	362	362	362	362	362	362	362	362	362	522	522	522	522	522	522	522
Ag	$M							24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Rh	$M							40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Pd	$M							5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Total Gross Revenue	$M	233,908	128,118					1,844	1,844	1,844	1,844	1,844	1,968	1,968	1,968	1,968	1,968	2,622	2,622	2,622	2,622	2,622	2,622	2,622	2,622	2,622	2,622	2,622	2,622	2,622	2,622	3,486	3,486	3,486	3,486	3,486	3,486	3,486
Realization Charges	$M	-11,089	-10,900					-145	-145	-145	-145	-145	-156	-156	-156	-156	-156	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-311	-311	-311	-311	-311	-311	-311
Net Smelter Revenue	$M	120,197	117,218					1,699	1,699	1,699	1,699	1,699	1,811	1,811	1,811	1,811	1,811	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	3,175	3,175	3,175	3,175	3,175	3,175	3,175
Operating Costs																																						
Operating Cost	$M	-96,063	-45,901				-269	-668	-668	-668	-668	-668	-723	-723	-723	-723	-723	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180
Operating Profit		117,906	71,317				-269	1031	1031	1031	1031	1031	1089	1089	1089	1089	1089	1407	1407	1407	1407	1407	1407	1407	1407	1407	1407	1407	1407	1407	1407	1407	1994	1994	1994	1994	1994	1994	1994
Royalties and Local Production Taxes																																						
Tech 4% Pre-Payback, 5% Post-Payback			-3,528					-41	-41	-41	-41	-41	-54	-54	-54	-54	-54	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-70	-100	-100	-100	-100	-100	-100	-100
Local Production Taxes (5%)			-4,155	-59	-59	-59	-59	-55	-55	-55	-55	-55	-60	-60	-60	-60	-60	-81	-81	-81	-81	-81	-81	-81	-81	-81	-81	-81	-81	-81	-81	-145	-105	-105	-105	-105	-105	-105
Gross Profit				-59	-59	-59	-328	935	935	935	935	935	974	974	974	974	974	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,255	1,750	1,790	1,790	1,790	1,790	1,790	1,790
Costs																																						
Capital Costs																																						
Mining	$M	-431		-108	-108	-108	-108																															
Process	$M	-1,058		-265	-265	-265	-265																															
Molybdenum Saration	$M	-84		-21	-21	-21	-21																															
Secondary Gold Plant	$M	-161		-40	-40	-40	-40																															
Infrastructure	$M	-422		-106	-106	-106	-106																															
Tailings	$M	-294		-74	-74	-74	-74																															
Pipelines	$M	-98		-24	-24	-24	-24																															
Access Road	$M	-162		-41	-41	-41	-41																															
Port infrastructure	$M	-155		-39	-39	-39	-39																															
Port process	$M	-87		-22	-22	-22	-22																															
Power generation	$M	-534		-134	-134	-134	-134																															
Indirect costs	$M	-1,407		-352	-352	-352	-352																															
Contingency	$M	-866		-216	-216	-216	-216																															
Sub-Total Capital Costs	$M	-5,757		-1,439	-1,439	-1,439	-1,439																															
Molybdenum Autoclave	$M	-374		-94	-94	-94	-94																															
Escalation/De-escalation Adjustment	$M	121		30	30	30	30																															
Outsourced Infrastructure	$M	1,315		329	329	329	329																															
Total Capital Costs	$M	-4,695	-4,695	-1,174	-1,174	-1,174	-1,174																															
Sustaining Capital Costs																																						
Open Pit	$M	-3,286																																				
Processing	$M	-230																																				
Infrastructure	$M	-165																																				
Waste Management	$M	-2,211																																				
Other	$M	-104																																				
Molybdenum Autoclave	$M	-144																																				
Total Sustaining Capital Costs	$M	-6,140	-6,828					-65.2	-65.2	-65.2	-65.2	-65.2	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-900	-96	-96	-96	-96	-96	-96
Total Capital Costs			-11,523	-1,174	-1,174	-1,174	-1,174	-65	-65	-65	-65	-65	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-900	-96	-96	-96	-96	-96	-96
Net Cash Flow			52,111	-1,232	-1,232	-1,232	-1,501	870	870	870	870	870	870	870	870	870	870	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038	1,038	850	1,694	1,694	1,694	1,694	1,694	1,694
Cumulative Cash Flow				-1,232	-2,465	-3,697	-5,199	-4,329	-3,459	-2,589	-1,719	-850	21	891	1,762	2,632	3,503	4,540	5,578	6,616	7,653	8,691	9,729	10,766	11,804	12,842	13,879	14,917	15,955	16,992	18,030	19,067	19,918	21,612	23,306	25,001	26,695	28,390	30,084
NPV @ 0% DROR	$M	55,278	52,111																																			
NPV @ 5% DROR	$M	11,163	11,311																																			
NPV @ 7% DROR	$M	6,129	6,360																																			
NPV @ 8% DROR	$M	4,510	4,737																																			
NPV @ 10% DROR	$M	2,308	2,501																																			
IRR	%	14.2	14.5																																			
Payback	years	6.2	6.3																																			
Taxes																																						

Pebble Mine Pro Forma
2011 Preliminary Assessment
45-Year Mine Resource Case

Description	Units	2011 Actual	Calculated Total	Year 33	34	35	36	37	38	39	40	41	42	43	44	45
Production																
Mining																
Ore	t		3,761	89	89	89	89	89	89	89	89	89	89	89	89	89
Waste	t		7,904	177	177	177	177	177	177	177	177	177	177	177	177	115
Strip Ratio (Waste/Ore)			2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.3
Processing																
Ore Milled	t	3,767	3,761	89	89	89	89	89	89	89	89	89	89	89	89	89
Cu Grade	%	0.46		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Au Grade	oz./t	0.011		0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Mo Grade	ppm	214		242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3
Cu Recovery	%	88		89	89	89	89	89	89	89	89	89	89	89	89	89
Au Recovery	%	71		71	71	71	71	71	71	71	71	71	71	71	71	71
Mo Recovery	%	88		90	90	90	90	90	90	90	90	90	90	90	90	90
Concentrate Production																
Cu Au Concentrate																
Cu Pounds	Mlb.	30,494	29,985	867	867	867	867	867	867	867	867	867	867	867	867	867
Au Ounces	Koz.	30,307	30,152	692	692	692	692	692	692	692	692	692	692	692	692	692
Ag Ounces	Koz.	140,423		1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
Rh Kilograms	Kkg	1,158		15	15	15	15	15	15	15	15	15	15	15	15	15
Pd Ounces	Koz.	907		12	12	12	12	12	12	12	12	12	12	12	12	12
Mo Concentrate																
Mo Pounds	Mlb.	1,420	1,361	39	39	39	39	39	39	39	39	39	39	39	39	39
Revenue																
Metal Prices																
Cu	$/lb.	2.50		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz.	1,050.00		1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/lb.	13.50		13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz.	15.00		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg	3,000.00		3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz.	490.00		490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																
Cu	$M		74,961	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168
Au	$M		31,660	727	727	727	727	727	727	727	727	727	727	727	727	727
Mo	$M		18,369	522	522	522	522	522	522	522	522	522	522	522	522	522
Ag	$M			24	24	24	24	24	24	24	24	24	24	24	24	24
Rh	$M			40	40	40	40	40	40	40	40	40	40	40	40	40
Pd	$M			5	5	5	5	5	5	5	5	5	5	5	5	5
Total Gross Revenue	$M	233,908	128,118	3,486	3,486	3,486	3,486	3,486	3,486	3,486	3,486	3,486	3,486	3,486	3,486	3,486
Realization Charges	$M	-11,089	-10,900	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311
Net Smelter Revenue	$M	120,197	117,218	3,175	3,175	3,175	3,175	3,175	3,175	3,175	3,175	3,175	3,175	3,175	3,175	3,175
Operating Costs																
Operating Cost	$M	-96,063	-45,901	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180
Operating Profit		117,906	71,317	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994
Royalties and Local Production Taxes																
Tech 4% Pre-Payback, 5% Post-Payback			-3,528	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100	-100
Local Production Taxes (5%)			-4,155	-105	-105	-105	-105	-105	-105	-105	-105	-105	-105	-105	-105	-105
Gross Profit				1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790	1,790
Costs																
Capital Costs																
Mining	$M	-431														
Process	$M	-1,058														
Molybdenum Saration	$M	-84														
Secondary Gold Plant	$M	-161														
Infrastructure	$M	-422														
Tailings	$M	-294														
Pipelines	$M	-98														
Access Road	$M	-162														
Port infrastructure	$M	-155														
Port process	$M	-87														
Power generation	$M	-534														
Indirect costs	$M	-1,407														
Contingency	$M	-866														
Sub-Total Capital Costs	$M	-5,757														
Molybdenum Autoclave	$M	-374														
Escalation/De-escalation Adjustment	$M	121														
Outsourced Infrastructure	$M	1,315														
Total Capital Costs	$M	-4,695	-4,695													
Sustaining Capital Costs																
Open Pit	$M	-3,286														
Processing	$M	-230														
Infrastructure	$M	-165														
Waste Management	$M	-2,211														
Other	$M	-104														
Molybdenum Autoclave	$M	-144														
Total Sustaining Capital Costs	$M	-6,140	-6,828	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96
Total Capital Costs			-11,523	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96
Net Cash Flow			52,111	1,694	1,694	1,694	1,694	1,694	1,694	1,694	1,694	1,694	1,694	1,694	1,694	1,694
Cumulative Cash Flow				31,778	33,473	35,167	36,862	38,556	40,250	41,945	43,639	45,334	47,028	48,722	50,417	52,111
NPV @ 0% DROR	$M	55,278	52,111													
NPV @ 5% DROR	$M	11,163	11,311													
NPV @ 7% DROR	$M	6,129	6,360													
NPV @ 8% DROR	$M	4,510	4,737													
NPV @ 10% DROR	$M	2,308	2,501													
IRR	%	14.2	14.5													
Payback	years	6.2	6.3													
Taxes																

Description	Units	2011 Actual	Calculated Total	Year -4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Production																																
Mining																																
Ore	t		1,989					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
Waste	t		4,422					67	67	67	67	67	95	95	95	95	95	241	241	241	241	241	241	241	241	241	241	241	241	241	241	241
Strip Ratio (Waste/Ore)			2.2					1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Processing																																
Ore Milled	t	1,990	1,989					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
Cu Grade	%	0.38						0.36	0.36	0.36	0.36	0.36	0.34	0.34	0.34	0.34	0.34	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Au Grade	oz/t	0.012						0.0112	0.0112	0.0112	0.0112	0.0112	0.0107	0.0107	0.0107	0.0107	0.0107	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118
Mo Grade	ppm	182						171.1	171.1	171.1	171.1	171.1	158.8	158.8	158.8	158.8	158.8	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5
Cu Recovery	%	87						82	82	82	82	82	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
Au Recovery	%	72						70	70	70	70	70	70	70	70	70	70	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Mo Recovery	%	85						79	79	79	79	79	82	82	82	82	82	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Concentrate Production																																
Cu Au Concentrate																																
Cu lbs	M lb	12,944	12,637					393	393	393	393	393	427	427	427	427	427	569	569	569	569	569	569	569	569	569	569	569	569	569	569	569
Au Oz	k oz	16,391	16,313					522	522	522	522	522	547	547	547	547	547	731	731	731	731	731	731	731	731	731	731	731	731	731	731	731
Ag Oz	k oz	67,205						862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862
Rh kg	K kg	502						6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Pd Oz	k oz	385						5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mo Concentrate																																
Mo lbs	M lb	616	588					18	18	18	18	18	19	19	19	19	19	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Revenue																																
Metal Prices																																
Cu	$/#	2.50						2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz	1,050.00						1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/#	13.50						13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz	15.00						15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg	3,000.00						3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz	490.00						490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																																
Cu	$ M		31,592					983	983	983	983	983	1,067	1,067	1,067	1,067	1,067	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423
Au	$ M		17,129					548	548	548	548	548	574	574	574	574	574	768	768	768	768	768	768	768	768	768	768	768	768	768	768	768
Mo	$ M		7,935					243	243	243	243	243	257	257	257	257	257	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362
Ag	$ M							12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Rh	$ M							17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Pd	$ M							2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total Gross Revenue	$ M	54,637	57,435					1,806	1,806	1,806	1,806	1,806	1,929	1,929	1,929	1,929	1,929	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584
Realization Charges	$ M	-4,752	-4,671					-145	-145	-145	-145	-145	-156	-156	-156	-156	-156	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211
Net Smelter Revenue	$ M	54,637	52,764					1,661	1,661	1,661	1,661	1,661	1,773	1,773	1,773	1,773	1,773	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373
Operating Costs																																
Operating Cost	$ M	-22,208	-22,295				-269	-668	-668	-668	-668	-668	-723	-723	-723	-723	-723	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005
Operating Profit		117,906	30,469				-269	993	993	993	993	993	1050	1050	1050	1050	1050	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368
Royalties and Local Production Taxes																																
Tech 4% pre-payback, 5% post-payback			-1,487					-40	-40	-40	-40	-40	-53	-53	-53	-53	-53	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68
Local Production Taxes (5%)			-1,977	-59	-59	-59	-59	-53	-53	-53	-53	-53	-58	-58	-58	-58	-58	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79
Gross Profit				-59	-59	-59	-328	900	900	900	900	900	940	940	940	940	940	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221
Costs																																
Capital Costs																																
Mining	$ M	-431		-108	-108	-108	-108																									
Process	$ M	-1,058		-265	-265	-265	-265																									
Molybdenum Saration	$ M	-84		-21	-21	-21	-21																									
Secondary Gold Plant	$ M	-161		-40	-40	-40	-40																									
Infrastructure	$ M	-422		-106	-106	-106	-106																									
Tailings	$ M	-294		-74	-74	-74	-74																									
Pipelines	$ M	-98		-24	-24	-24	-24																									
Access Road	$ M	-162		-41	-41	-41	-41																									
Port infrastructure	$ M	-155		-39	-39	-39	-39																									
Port process	$ M	-87		-22	-22	-22	-22																									
Power generation	$ M	-534		-134	-134	-134	-134																									
Indirect costs	$ M	-1,407		-352	-352	-352	-352																									
Contingency	$ M	-866		-216	-216	-216	-216																									
Sub-Total Capital Costs	$ M	-5,757		-1,439	-1,439	-1,439	-1,439																									
Molybdenum Autoclave	$ M	-374		-94	-94	-94	-94																									
Escalation/De-escalation Adjustment	$ M	121		30	30	30	30																									
Outsourced Infrastructure	$ M	1,315		329	329	329	329																									
Total Capital Costs	$ M	-4,695	-4,695	-1,174	-1,174	-1,174	-1,174																									
Sustaining Capital Costs																																
Open Pit	$ M	-2,047																														
Processing	$ M	-146																														
Infrastructure	$ M	-12																														
Waste Management	$ M	-846																														
Infrastructure	$ M	-70																														
Molybdenum Autoclave	$ M	-83																														
Total Sustaining Capital Costs	$ M	-3,204	-4,107					-65.2	-65.2	-65.2	-65.2	-65.2	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217
Total Capital Costs			-8,802	-1,174	-1,174	-1,174	-1,174	-65	-65	-65	-65	-65	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217
Net Cash Flow			18,203	-1,232	-1,232	-1,232	-1,501	835	835	835	835	835	836	836	836	836	836	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003
Cumulative Cash Flow				-1,232	-2,465	-3,697	-5,199	-4,364	-3,529	-2,694	-1,859	-1,024	-188	648	1,484	2,320	3,156	4,159	5,162	6,165	7,169	8,172	9,175	10,178	11,181	12,184	13,187	14,191	15,194	16,197	17,200	18,203
NPV @ 0% DROR	$ M	20,123	18,203																													
NPV @ 5% DROR	$ M	6,363	5,975																													
NPV @ 7% DROR	$ M	3,837	3,640																													
NPV @ 8% DROR	$ M	2,901	2,764																													
NPV @ 10% DROR	$ M	1,485	1,425																													
IRR	%	13.4	13.4																													
Payback	years	6.2	6.3																													

Pebble Mine Pro Forma
2011 Preliminary Assessment
25-Year Mine Resource Case, Sensitivity Case 1 - 100% Increase Captial Costs

Description	Units	2011 Actual	Calculated Total	Year -4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Production																																
Mining																																
Ore	t		1,989					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
Waste	t		4,422					67	67	67	67	67	95	95	95	95	95	241	241	241	241	241	241	241	241	241	241	241	241	241	241	241
Strip Ratio (Waste/Ore)			2.2					1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Processing																																
Ore Milled	t	1,990	1,989					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
Cu Grade	%	0.38						0.36	0.36	0.36	0.36	0.36	0.34	0.34	0.34	0.34	0.34	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Au Grade	oz/t	0.012						0.0112	0.0112	0.0112	0.0112	0.0112	0.0107	0.0107	0.0107	0.0107	0.0107	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118
Mo Grade	ppm	182						171.1	171.1	171.1	171.1	171.1	158.8	158.8	158.8	158.8	158.8	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5
Cu Recovery	%	87						82	82	82	82	82	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87
Au Recovery	%	72						70	70	70	70	70	70	70	70	70	70	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72
Mo Recovery	%	85						79	79	79	79	79	82	82	82	82	82	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Concentrate Production																																
Cu Au Concentrate																																
Cu lbs	M lb	12,944	12,637					393	393	393	393	393	427	427	427	427	427	569	569	569	569	569	569	569	569	569	569	569	569	569	569	569
Au Oz	k oz	16,391	16,313					522	522	522	522	522	547	547	547	547	547	731	731	731	731	731	731	731	731	731	731	731	731	731	731	731
Ag Oz	k oz	67,205						862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862	862
Rh kg	K kg	502						6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Pd Oz	k oz	385						5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mo Concentrate																																
Mo lbs	M lb	616	588					18	18	18	18	18	19	19	19	19	19	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Revenue																																
Metal Prices																																
Cu	$/#	2.50						2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz	1,050.00						1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/#	13.50						13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz	15.00						15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg	3,000.00						3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz	490.00						490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																																
Cu	$ M		31,592					983	983	983	983	983	1,067	1,067	1,067	1,067	1,067	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423
Au	$ M		17,129					548	548	548	548	548	574	574	574	574	574	768	768	768	768	768	768	768	768	768	768	768	768	768	768	768
Mo	$ M		7,935					243	243	243	243	243	257	257	257	257	257	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362
Ag	$ M							12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Rh	$ M							17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Pd	$ M							2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total Gross Revenue	$ M	54,637	57,435					1,806	1,806	1,806	1,806	1,806	1,929	1,929	1,929	1,929	1,929	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584	2,584
Realization Charges	$ M	-4,752	-4,671					-145	-145	-145	-145	-145	-156	-156	-156	-156	-156	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211
Net Smelter Revenue	$ M	54,637	52,764					1,661	1,661	1,661	1,661	1,661	1,773	1,773	1,773	1,773	1,773	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373	2,373
Operating Costs																																
Operating Cost	$ M	-22,208	-22,295				-269	-668	-668	-668	-668	-668	-723	-723	-723	-723	-723	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005
Operating Profit		17,906	30,469				-269	993	993	993	993	993	1050	1050	1050	1050	1050	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368
Royalties and Local Production Taxes																																
Tech 4% pre-payback, 5% post-payback			-1,487					-40	-40	-40	-40	-40	-53	-53	-53	-53	-53	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68	-68
Local Production Taxes (5%)			-2,212	-117	-117	-117	-117	-53	-53	-53	-53	-53	-58	-58	-58	-58	-58	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79	-79
Gross Profit				-117	-117	-117	-386	900	900	900	900	900	940	940	940	940	940	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221	1,221
Costs																																
Capital Costs																																
Mining	$ M	-431	-861.6	-215	-215	-215	-215																									
Process	$ M	-1,058	-2116.4	-529	-529	-529	-529																									
Molybdenum Saration	$ M	-84	-167	-42	-42	-42	-42																									
Secondary Gold Plant	$ M	-161	-321	-80	-80	-80	-80																									
Infrastructure	$ M	-422	-844	-211	-211	-211	-211																									
Tailings	$ M	-294	-588	-147	-147	-147	-147																									
Pipelines	$ M	-98	-195	-49	-49	-49	-49																									
Access Road	$ M	-162	-324	-81	-81	-81	-81																									
Port infrastructure	$ M	-155	-309	-77	-77	-77	-77																									
Port process	$ M	-87	-174.2	-44	-44	-44	-44																									
Power generation	$ M	-534	-1068.2	-267	-267	-267	-267																									
Indirect costs	$ M	-1,407	-2813.6	-703	-703	-703	-703																									
Contingency	$ M	-866	-1731.4	-433	-433	-433	-433																									
Sub-Total Capital Costs	$ M	-5,757	-11513.4	-2,878	-2,878	-2,878	-2,878																									
Molybdenum Autoclave	$ M	-374	-748.4	-187	-187	-187	-187																									
Escalation/De-escalation Adjustment	$ M	121	242.2	61	61	61	61																									
Outsourced Infrastructure	$ M	1,315	2630	658	658	658	658																									
Total Capital Costs	$ M	-4,695	-9389.6	-2,347	-2,347	-2,347	-2,347																									
Sustaining Capital Costs																																
Open Pit	$ M	-2,047																														
Processing	$ M	-146																														
Infrastructure	$ M	-12																														
Waste Management	$ M	-846																														
Infrastructure	$ M	-70																														
Molybdenum Autoclave	$ M	-83																														
Total Sustaining Capital Costs	$ M	-3,204	-4,107					-65.2	-65.2	-65.2	-65.2	-65.2	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217
Total Capital Costs			-13,497	-2,347	-2,347	-2,347	-2,347	-65	-65	-65	-65	-65	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217
Net Cash Flow			13,274	-2,465	-2,465	-2,465	-2,734	835	835	835	835	835	836	836	836	836	836	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003
Cumulative Cash Flow				-2,465	-4,930	-7,394	-10,128	-9,293	-8,458	-7,623	-6,788	-5,954	-5,118	-4,282	-3,446	-2,610	-1,774	-770	233	1,236	2,239	3,242	4,245	5,248	6,252	7,255	8,258	9,261	10,264	11,267	12,270	13,274
NPV @ 0% DROR	$ M	20,123	13,274																													
NPV @ 5% DROR	$ M	6,363	1,605																													
NPV @ 7% DROR	$ M	3,837	-535																													
NPV @ 8% DROR	$ M	2,901	-1,318																													
NPV @ 10% DROR	$ M	1,485	-2,482																													
IRR	%	13.4	6.4																													
Payback	years	6.2	12+																													
Taxes																																
Net Cash Flow After Tax																																

Description	Units	78-Year Wardro	Calculated Total	Year -4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Production																																							
Mining																																							
Ore	t		6,526					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	89	89	89	89	89	89	89
Waste	t		17,247					67	67	67	67	67	95	95	95	95	95	241	241	241	241	241	241	241	241	241	241	241	241	241	241	241	177	177	177	177	177	177	177
Strip Ratio (Waste/Ore)			2.6					1.0	1.0	1.0	1.0	1.0	1.3	1.3	1.3	1.3	1.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Processing																																							
Ore Milled	t	6,528	6,526					67	67	67	67	67	73	73	73	73	73	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	89	89	89	89	89	89	89
Cu Grade	%	0.47						0.36	0.36	0.36	0.36	0.36	0.34	0.34	0.34	0.34	0.34	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Au Grade	oz/t	0.0108						0.0112	0.0112	0.0112	0.0112	0.0112	0.0107	0.0107	0.0107	0.0107	0.0107	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.0118	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Mo Grade	ppm	243						171.1	171.1	171.1	171.1	171.1	158.8	158.8	158.8	158.8	158.8	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	183.5	242.3	242.3	242.3	242.3	242.3	242.3	242.3
Cu Recovery	%	88						82	82	82	82	82	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	89	89	89	89	89	89	89
Au Recovery	%	71						70	70	70	70	70	70	70	70	70	70	72	72	72	72	72	72	72	72	72	72	72	72	72	72	72	71	71	71	71	71	71	71
Mo Recovery	%	89						79	79	79	79	79	82	82	82	82	82	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	90	90	90	90	90	90	90
Concentrate Production																																							
Cu Au Concentrate																																							
Cu lbs	M lb	53,437	53,346					393	393	393	393	393	427	427	427	427	427	569	569	569	569	569	569	569	569	569	569	569	569	569	569	569	867	867	867	867	867	867	867
Au Oz	k oz	50,133	49,810					522	522	522	522	522	547	547	547	547	547	731	731	731	731	731	731	731	731	731	731	731	731	731	731	731	692	692	692	692	692	692	692
Ag Oz	k oz	241,719						3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099
Rh kg	K kg	2,312						30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Pd Oz	k oz	1,589						20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mo Concentrate																																							
Mo lbs	M lb	2,835	2,788					18	18	18	18	18	19	19	19	19	19	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	39	39	39	39	39	39	39
Revenue																																							
Metal Prices																																							
Cu	$/#	2.50						2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz	1,050.00						1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/#	13.50						13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz	15.00						15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg	3,000.00						3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz	490.00						490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																																							
Cu	$ M		133,366					983	983	983	983	983	1,067	1,067	1,067	1,067	1,067	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	1,423	2,168	2,168	2,168	2,168	2,168	2,168	2,168
Au	$ M		52,301					548	548	548	548	548	574	574	574	574	574	768	768	768	768	768	768	768	768	768	768	768	768	768	768	768	727	727	727	727	727	727	727
Mo	$ M		37,637					243	243	243	243	243	257	257	257	257	257	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	522	522	522	522	522	522	522
Ag	$ M							42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Rh	$ M							80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Pd	$ M							9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total Gross Revenue	$ M	233,908	233,510					1,905	1,905	1,905	1,905	1,905	2,029	2,029	2,029	2,029	2,029	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	2,684	3,388	3,548	3,548	3,548	3,548	3,548	3,548
Realization Charges	$ M	-19,938	-19,937					-145	-145	-145	-145	-145	-156	-156	-156	-156	-156	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-211	-311	-311	-311	-311	-311	-311	-311
Net Smelter Revenue	$ M	213,970	213,573					1,760	1,760	1,760	1,760	1,760	1,873	1,873	1,873	1,873	1,873	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	2,473	3,077	3,236	3,236	3,236	3,236	3,236	3,236
Operating Costs																																							
Operating Cost (original)	$ M	-96,063	-96,063				-269	-668	-668	-668	-668	-668	-723	-723	-723	-723	-723	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,005	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180
Factor																																							
Operating Cost (revised)																																							
Operating Profit		117,906	117,510				-269	1092	1092	1092	1092	1092	1150	1150	1150	1150	1150	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1468	1897	2056	2056	2056	2056	2056	2056
Royalties and Local Production Taxes																																							
Tech 4% pre-payback, 5% post-payback			-5,834					-44	-44	-44	-44	-44	-57	-57	-57	-57	-57	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-95	-103	-103	-103	-103	-103	-103
Local Production Taxes (5%)			-6,710	-59	-59	-59	-59	-58	-58	-58	-58	-58	-63	-63	-63	-63	-63	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-84	-140	-108	-108	-108	-108	-108	-108
Gross Profit				-59	-59	-59	-328	991	991	991	991	991	1,030	1,030	1,030	1,030	1,030	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,662	1,845	1,845	1,845	1,845	1,845	1,845
Costs																																							
Capital Costs																																							
Mining	$ M	-431		-108	-108	-108	-108																																
Process	$ M	-1,058		-265	-265	-265	-265																																
Molybdenum Saration	$ M	-84		-21	-21	-21	-21																																
Secondary Gold Plant	$ M	-161		-40	-40	-40	-40																																
Infrastructure	$ M	-422		-106	-106	-106	-106																																
Tailings	$ M	-294		-74	-74	-74	-74																																
Pipelines	$ M	-98		-24	-24	-24	-24																																
Access Road	$ M	-162		-41	-41	-41	-41																																
Port infrastructure	$ M	-155		-39	-39	-39	-39																																
Port process	$ M	-87		-22	-22	-22	-22																																
Power generation	$ M	-534		-134	-134	-134	-134																																
Indirect costs	$ M	-1,407		-352	-352	-352	-352																																
Contingency	$ M	-866		-216	-216	-216	-216																																
Sub-Total Capital Costs	$ M	-5,757		-1,439	-1,439	-1,439	-1,439																																
Molybdenum Autoclave	$ M	-374		-94	-94	-94	-94																																
Escalation/De-escalation Adjustment	$ M	121		30	30	30	30																																
Outsourced Infrastructure	$ M	1,315		329	329	329	329																																
Total Capital Costs	$ M	-4,695	-4,695	-1,174	-1,174	-1,174	-1,174																																
Sustaining Capital Costs																																							
Open Pit	$ M	-7,225																																					
Processing	$ M	-517																																					
Infrastructure	$ M	-165																																					
Waste Management	$ M	-3,364																																					
Other	$ M	-180																																					
Molybdenum Autoclave	$ M	-276																																					
Total Sustaining Capital Costs	$ M	-11,727	-11,726					-65.2	-65.2	-65.2	-65.2	-65.2	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-900	-96	-96	-96	-96	-96	-96
Total Capital Costs			-16,421	-1,174	-1,174	-1,174	-1,174	-65	-65	-65	-65	-65	-104	-104	-104	-104	-104	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-217	-900	-96	-96	-96	-96	-96	-96
Net Cash Flow			88,545	-1,232	-1,232	-1,232	-1,501	926	926	926	926	926	926	926	926	926	926	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	762	1,750	1,750	1,750	1,750	1,750	1,750
Cumulative Cash Flow				-1,232	-2,465	-3,697	-5,199	-4,273	-3,347	-2,422	-1,496	-571	355	1,281	2,207	3,132	4,058	5,151	6,244	7,336	8,429	9,522	10,615	11,708	12,801	13,894	14,986	16,079	17,172	18,265	19,358	20,451	21,213	22,962	24,712	26,461	28,211	29,961	31,710
NPV @ 0% DROR	$ M	87,329	88,545																																				
NPV @ 5% DROR	$ M	12,941	13,866																																				
NPV @ 7% DROR	$ M	6,812	7,507																																				
NPV @ 8% DROR	$ M	4,964	5,562																																				
NPV @ 10% DROR	$ M	2,545	2,987																																				
IRR	%	14.5	15.2																																				
Payback	years	6.1	6.3																																				
Net Cash Flow After Tax																																							

Description	Units	78-Year Wardro	Calculated Total	Year 33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
Production																																							
Mining																																							
Ore	t		6,526	89	89	89	89	89	89	89	89	89	89	89	89	89	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	82	82	82	82	82	82	82	82
Waste	t		17,247	177	177	177	177	177	177	177	177	177	177	177	177	115	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	426	426	426	426	426	426	426	426
Strip Ratio (Waste/Ore)			2.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Processing																																							
Ore Milled	t	6,528	6,526	89	89	89	89	89	89	89	89	89	89	89	89	89	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	82	82	82	82	82	82	82	82
Cu Grade	%	0.47		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Au Grade	oz/t	0.0108		0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0106	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095
Mo Grade	ppm	243		242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	242.3	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	267.9	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8
Cu Recovery	%	88		89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
Au Recovery	%	71		71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
Mo Recovery	%	89		90	90	90	90	90	90	90	90	90	90	90	90	90	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Concentrate Production																																							
Cu Au Concentrate																																							
Cu lbs	M lb	53,437	53,346	867	867	867	867	867	867	867	867	867	867	867	867	867	735	735	735	735	735	735	735	735	735	735	735	735	735	735	735	685	685	685	685	685	685	685	685
Au Oz	k oz	50,133	49,810	692	692	692	692	692	692	692	692	692	692	692	692	692	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	552	552	552	552	552	552	552	552
Ag Oz	k oz	241,719		3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099
Rh kg	K kg	2,312		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Pd Oz	k oz	1,589		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Mo Concentrate																																							
Mo lbs	M lb	2,835	2,788	39	39	39	39	39	39	39	39	39	39	39	39	39	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	45	45	45	45	45	45	45	45
Revenue																																							
Metal Prices																																							
Cu	$/#	2.50		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Au	$/oz	1,050.00		1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00
Mo	$/#	13.50		13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Ag	$/oz	15.00		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Rh	$/kg	3,000.00		3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
Pd	$/oz	490.00		490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00
Gross Revenue																																							
Cu	$ M		133,366	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,838	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713
Au	$ M		52,301	727	727	727	727	727	727	727	727	727	727	727	727	727	680	680	680	680	680	680	680	680	680	680	680	680	680	680	680	580	580	580	580	580	580	580	580
Mo	$ M		37,637	522	522	522	522	522	522	522	522	522	522	522	522	522	567	567	567	567	567	567	567	567	567	567	567	567	567	567	567	607	607	607	607	607	607	607	607
Ag	$ M			42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Rh	$ M			80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Pd	$ M			9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total Gross Revenue	$ M	233,908	233,510	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,548	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,216	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031
Realization Charges	$ M	-19,938	-19,937	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-311	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-281	-268	-268	-268	-268	-268	-268	-268	-268
Net Smelter Revenue	$ M	213,970	213,573	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	3,236	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,935	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763
Operating Costs																																							
Operating Cost (original)	$ M	-96,063	-96,063	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,180	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,086	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881
Factor																																							
Operating Cost (revised)																																							
Operating Profit		117,906	117,510	2056	2056	2056	2056	2056	2056	2056	2056	2056	2056	2056	2056	2056	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	1849	881	881	881	881	881	881	881	881
Royalties and Local Production Taxes																																							
Tech 4% pre-payback, 5% post-payback			-5,834	-103	-103	-103	-103	-103	-103	-103	-103	-103	-103	-103	-103	-103	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-44	-44	-44	-44	-44	-44	-44	-44
Local Production Taxes (5%)			-6,710	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-108	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-53	-53	-53	-53	-53	-53	-53	-53
Gross Profit				1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	1,658	784	784	784	784	784	784	784	784
Costs																																							
Capital Costs																																							
Mining	$ M	-431																																					
Process	$ M	-1,058																																					
Molybdenum Saration	$ M	-84																																					
Secondary Gold Plant	$ M	-161																																					
Infrastructure	$ M	-422																																					
Tailings	$ M	-294																																					
Pipelines	$ M	-98																																					
Access Road	$ M	-162																																					
Port infrastructure	$ M	-155																																					
Port process	$ M	-87																																					
Power generation	$ M	-534																																					
Indirect costs	$ M	-1,407																																					
Contingency	$ M	-866																																					
Sub-Total Capital Costs	$ M	-5,757																																					
Molybdenum Autoclave	$ M	-374																																					
Escalation/De-escalation Adjustment	$ M	121																																					
Outsourced Infrastructure	$ M	1,315																																					
Total Capital Costs	$ M	-4,695	-4,695																																					
Sustaining Capital Costs																																							
Open Pit	$ M	-7,225																																					
Processing	$ M	-517																																					
Infrastructure	$ M	-165																																					
Waste Management	$ M	-3,364																																					
Other	$ M	-180																																					
Molybdenum Autoclave	$ M	-276																																					
Total Sustaining Capital Costs	$ M	-11,727	-11,726	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-176	-176	-176	-176	-176	-176	-176	-176
Total Capital Costs			-16,421	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-96	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-115	-176	-176	-176	-176	-176	-176	-176	-176
Net Cash Flow			88,545	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	1,543	608	608	608	608	608	608	608	608
Cumulative Cash Flow				33,460	35,209	36,959	38,709	40,458	42,208	43,957	45,707	47,457	49,206	50,956	52,705	54,455	55,998	57,541	59,084	60,626	62,169	63,712	65,255	66,798	68,341	69,884	71,426	72,969	74,512	76,055	77,598	78,206	78,814	79,423	80,031	80,639	81,247	81,855	82,463
NPV @ 0% DROR	$ M	87,329	88,545																																				
NPV @ 5% DROR	$ M	12,941	13,866																																				
NPV @ 7% DROR	$ M	6,812	7,507																																				
NPV @ 8% DROR	$ M	4,964	5,562																																				
NPV @ 10% DROR	$ M	2,545	2,987																																				
IRR	%	14.5	15.2																																				
Payback	years	6.1	6.3																																				
Net Cash Flow After Tax																																							

Pebble Mine Pro Forma
2011 Preliminary Assessment
39-Year Mine Resource Case, Sensitivity Case 2 - Double Rate of Production

Description	Units	78-Year Wardro	Calculated Total	Year 69	70	71	72	73	74	75	76	77	78	39-Year Case -4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Production																																					
Mining																																					
Ore	t		6,526	82	82	82	82	82	82	82	82	82	82																								
Waste	t		17,247	426	426	426	426	426	426	426	426	426	426																								
Strip Ratio (Waste/Ore)			2.6	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2																								
Processing																																					
Ore Milled	t	6,528	6,526	82	82	82	82	82	82	82	82	82	82																								
Cu Grade	%	0.47		0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47																								
Au Grade	oz/t	0.0108		0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095	0.0095																								
Mo Grade	ppm	243		301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8	301.8																								
Cu Recovery	%	88		89	89	89	89	89	89	89	89	89	89																								
Au Recovery	%	71		71	71	71	71	71	71	71	71	71	71																								
Mo Recovery	%	89		91	91	91	91	91	91	91	91	91	91																								
Concentrate Production																																					
Cu Au Concentrate																																					
Cu lbs	M lb	53,437	53,346	685	685	685	685	685	685	685	685	685	685																								
Au Oz	k oz	50,133	49,810	552	552	552	552	552	552	552	552	552	552																								
Ag Oz	k oz	241,719		3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099	3,099																								
Rh kg	K kg	2,312		30	30	30	30	30	30	30	30	30	30																								
Pd Oz	k oz	1,589		20	20	20	20	20	20	20	20	20	20																								
Mo Concentrate																																					
Mo lbs	M lb	2,835	2,788	45	45	45	45	45	45	45	45	45	45																								
Revenue																																					
Metal Prices																																					
Cu	$/#	2.50		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50																								
Au	$/oz	1,050.00		1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00	1,050.00																								
Mo	$/#	13.50		13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50																								
Ag	$/oz	15.00		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00																								
Rh	$/kg	3,000.00		3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00																								
Pd	$/oz	490.00		490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00	490.00																								
Gross Revenue																																					
Cu	$ M		133,366	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713	1,713																								
Au	$ M		52,301	580	580	580	580	580	580	580	580	580	580																								
Mo	$ M		37,637	607	607	607	607	607	607	607	607	607	607																								
Ag	$ M			42	42	42	42	42	42	42	42	42	42																								
Rh	$ M			80	80	80	80	80	80	80	80	80	80																								
Pd	$ M			9	9	9	9	9	9	9	9	9	9																								
Total Gross Revenue	$ M	233,908	233,510	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031	3,031																								
Realization Charges	$ M	-19,938	-19,937	-268	-268	-268	-268	-268	-268	-268	-268	-268	-268																								
Net Smelter Revenue	$ M	213,970	213,573	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763	2,763					3,520	3,520	3,633	3,745	3,745	4,946	4,946	4,946	4,946	4,946	4,946	4,946	5,550	6,472	6,472	6,472	6,472	6,472	6,472	6,472
Operating Costs																																					
Operating Cost (original)	$ M	-96,063	-96,063	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881	-1,881				-269	-1,336	-1,336	-1,391	-1,446	-1,446	-2,010	-2,010	-2,010	-2,010	-2,010	-2,010	-2,010	-2,185	-2,361	-2,361	-2,361	-2,361	-2,361	-2,361	-2,361
Factor																		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Operating Cost (revised)																		-1,068	-1,068	-1,112	-1,156	-1,156	-1,608	-1,608	-1,608	-1,608	-1,608	-1,608	-1,608	-1,748	-1,888	-1,888	-1,888	-1,888	-1,888	-1,888	-1,888
Operating Profit		117,906	117,510	881	881	881	881	881	881	881	881	881	881				-269	2,452	2,452	2,520	2,589	2,589	3,338	3,338	3,338	3,338	3,338	3,338	3,338	3,802	4,584	4,584	4,584	4,584	4,584	4,584	4,584
Royalties and Local Production Taxes																																					
Tech 4% pre-payback, 5% post-payback			-5,834	-44	-44	-44	-44	-44	-44	-44	-44	-44	-44					-98	-98	-101	-104	-104	-167	-167	-167	-167	-167	-167	-167	-190	-229	-229	-229	-229	-229	-229	-229
Local Production Taxes (5%)			-6,710	-53	-53	-53	-53	-53	-53	-53	-53	-53	-53			-59	-59	-59	-123	-123	-126	-129	-129	-167	-167	-167	-167	-167	-167	-167	-190	-229	-229	-229	-229	-229	-229	-229
Gross Profit				784	784	784	784	784	784	784	784	784	784			-59	-59	-59	-328	2,231	2,231	2,294	2,356	2,356	3,004	3,004	3,004	3,004	3,004	3,004	3,004	3,421	4,125	4,125	4,125	4,125	4,125	4,125
Costs																																					
Capital Costs																																					
Mining	$ M	-431																																			
Process	$ M	-1,058																																			
Molybdenum Saration	$ M	-84																																			
Secondary Gold Plant	$ M	-161																																			
Infrastructure	$ M	-422																																			
Tailings	$ M	-294																																			
Pipelines	$ M	-98																																			
Access Road	$ M	-162																																			
Port infrastructure	$ M	-155																																			
Port process	$ M	-87																																			
Power generation	$ M	-534																																			
Indirect costs	$ M	-1,407																																			
Contingency	$ M	-866																																			
Sub-Total Capital Costs	$ M	-5,757																																			
Molybdenum Autoclave	$ M	-374																																			
Escalation/De-escalation Adjustment	$ M	121																																			
Outsourced Infrastructure	$ M	1,315																																			
Total Capital Costs	$ M	-4,695	-4,695													-1,878	-1,878	-1,878	-1,878																			
Sustaining Capital Costs																																					
Open Pit	$ M	-7,225																																			
Processing	$ M	-517																																			
Infrastructure	$ M	-165																																			
Waste Management	$ M	-3,364																																			
Other	$ M	-180																																			
Molybdenum Autoclave	$ M	-276																																			
Total Sustaining Capital Costs	$ M	-11,727	-11,726	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176					-130	-130	-169	-208	-208	-435	-435	-435	-435	-435	-435	-435	-1,117	-192	-192	-192	-192	-192	-192	-192
Total Capital Costs			-16,421	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176			-1,878	-1,878	-1,878	-1,878	-130	-130	-169	-208	-208	-435	-435	-435	-435	-435	-435	-1,117	-192	-192	-192	-192	-192	-192	-192
Net Cash Flow			88,545	608	608	608	608	608	608	608	608	608	608	103,629		-1,937	-1,937	-1,937	-2,206	2,101	2,101	2,124	2,148	2,148	2,569	2,569	2,569	2,569	2,569	2,569	2,304	3,934	3,934	3,934	3,934	3,934	3,934	3,934
Cumulative Cash Flow				83,072	83,680	84,288	84,896	85,504	86,113	86,721	87,329	87,937	88,545			-1,937	-3,873	-5,810	-8,015	-5,915	-3,814	-1,689	458	2,606	5,175	7,745	10,314	12,883	15,452	18,021	20,591	22,895	26,828	30,762	34,696	38,629	42,563	46,497	50,430
NPV @ 0% DROR	$ M	87,329	88,545																																		
NPV @ 5% DROR	$ M	12,941	13,866																																		
NPV @ 7% DROR	$ M	6,812	7,507											103,629																								
NPV @ 8% DROR	$ M	4,964	5,562											32,247																								
NPV @ 10% DROR	$ M	2,545	2,987											21,119																								
IRR	%	14.5	15.2											17,182																								
Payback	years	6.1	6.3											11,423																								
Net Cash Flow After Tax																																					

Pebble Mine Pro Forma
2011 Preliminary Assessment
39-Year Mine Resource Case, Sensitivity Case 2 - Double Rate of Production

Description	Units	78-Year Wardro	Calculated Total	39-Year Case 21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Production																						
Mining																						
Ore	t		6,526																			
Waste	t		17,247																			
Strip Ratio (Waste/Ore)			2.6																			
Processing																						
Ore Milled	t	6,528	6,526																			
Cu Grade	%	0.47																				
Au Grade	oz/t	0.0108																				
Mo Grade	ppm	243																				
Cu Recovery	%	88																				
Au Recovery	%	71																				
Mo Recovery	%	89																				
Concentrate Production																						
Cu Au Concentrate																						
Cu lbs	M lb	53,437	53,346																			
Au Oz	k oz	50,133	49,810																			
Ag Oz	k oz	241,719																				
Rh kg	K kg	2,312																				
Pd Oz	k oz	1,589																				
Mo Concentrate																						
Mo lbs	M lb	2,835	2,788																			
Revenue																						
Metal Prices																						
Cu	$/#	2.50																				
Au	$/oz	1,050.00																				
Mo	$/#	13.50																				
Ag	$/oz	15.00																				
Rh	$/kg	3,000.00																				
Pd	$/oz	490.00																				
Gross Revenue																						
Cu	$ M		133,366																			
Au	$ M		52,301																			
Mo	$ M		37,637																			
Ag	$ M																					
Rh	$ M																					
Pd	$ M																					
Total Gross Revenue	$ M	233,908	233,510																			
Realization Charges	$ M	-19,938	-19,937																			
Net Smelter Revenue	$ M	213,970	213,573	6,472	6,472	6,171	5,870	5,870	5,870	5,870	5,870	5,870	5,870	5,526	5,526	5,526	5,526	5,526	5,526	5,526	5,526	5,526
Operating Costs																						
Operating Cost (original)	$ M	-96,063	-96,063	-2,361	-2,361	-2,267	-2,173	-2,173	-2,173	-2,173	-2,173	-2,173	-2,173	-3,763	-3,763	-3,763	-3,763	-3,763	-3,763	-3,763	-3,763	-3,763
Factor				0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Operating Cost (revised)				-1,888	-1,888	-1,813	-1,738	-1,738	-1,738	-1,738	-1,738	-1,738	-1,738	-3,010	-3,010	-3,010	-3,010	-3,010	-3,010	-3,010	-3,010	-3,010
Operating Profit		117,906	117,510	4,584	4,584	4,358	4,132	4,132	4,132	4,132	4,132	4,132	4,132	2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515	2,515
Royalties and Local Production Taxes																						
Tech 4% pre-payback, 5% post-payback			-5,834	-229	-229	-218	-207	-207	-207	-207	-207	-207	-207	-126	-126	-126	-126	-126	-126	-126	-126	-126
Local Production Taxes (5%)			-6,710	-229	-229	-218	-207	-207	-207	-207	-207	-207	-207	-126	-126	-126	-126	-126	-126	-126	-126	-126
Gross Profit				4,125	4,125	3,922	3,718	3,718	3,718	3,718	3,718	3,718	3,718	2,264	2,264	2,264	2,264	2,264	2,264	2,264	2,264	2,264
Costs																						
Capital Costs																						
Mining	$ M	-431																				
Process	$ M	-1,058																				
Molybdenum Saration	$ M	-84																				
Secondary Gold Plant	$ M	-161																				
Infrastructure	$ M	-422																				
Tailings	$ M	-294																				
Pipelines	$ M	-98																				
Access Road	$ M	-162																				
Port infrastructure	$ M	-155																				
Port process	$ M	-87																				
Power generation	$ M	-534																				
Indirect costs	$ M	-1,407																				
Contingency	$ M	-866																				
Sub-Total Capital Costs	$ M	-5,757																				
Molybdenum Autoclave	$ M	-374																				
Escalation/De-escalation Adjustment	$ M	121																				
Outsourced Infrastructure	$ M	1,315																				
Total Capital Costs	$ M	-4,695	-4,695																			
Sustaining Capital Costs																						
Open Pit	$ M	-7,225																				
Processing	$ M	-517																				
Infrastructure	$ M	-165																				
Waste Management	$ M	-3,364																				
Other	$ M	-180																				
Molybdenum Autoclave	$ M	-276																				
Total Sustaining Capital Costs	$ M	-11,727	-11,726	-192	-192	-211	-230	-230	-230	-230	-230	-230	-230	-352	-352	-352	-352	-352	-352	-352	-352	-352
Total Capital Costs			-16,421	-192	-192	-211	-230	-230	-230	-230	-230	-230	-230	-352	-352	-352	-352	-352	-352	-352	-352	-352
Net Cash Flow			88,545	3,934	3,934	3,711	3,488	3,488	3,488	3,488	3,488	3,488	3,488	1,911	1,911	1,911	1,911	1,911	1,911	1,911	1,911	1,911
Cumulative Cash Flow				54,364	58,298	62,009	65,497	68,985	72,474	75,962	79,451	82,939	86,427	88,339	90,250	92,161	94,072	95,984	97,895	99,806	101,718	103,629
NPV @ 0% DROR	$ M	87,329	88,545																			
NPV @ 5% DROR	$ M	12,941	13,866																			
NPV @ 7% DROR	$ M	6,812	7,507																			
NPV @ 8% DROR	$ M	4,964	5,562																			
NPV @ 10% DROR	$ M	2,545	2,987																			
IRR	%	14.5	15.2																			
Payback	years	6.1	6.3																			
Net Cash Flow After Tax																						